UNPACKING AMBIDEXTERITY AT THE INDIVIDUAL LEVEL

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Previous research in the ambidexterity literature at the individual level focuses on finding characteristics of ambidextrous individuals. In this dissertation, I extend the current literature by suggesting a new way of conceptualizing ambidexterity using work experience theory and by operationalizing ambidexterity at the individual level using past work experience. I develop hypotheses about the outcomes of ambidextrous individuals that I test using data from the R&D centers of a multi-divisional electronics firm. The results indicate that the assignment of both exploration and exploitation to individuals has a positive effect on individual performance.

BIOGRAPHICAL SKETCH

Gun Jea Yu was born in Pusan, South Korea. He graduated from Sogang University and received a Bachelor of Science in business management, with a minor in economics. He received his M.S. in human resources management from the Krannert School of Management at Purdue University in 2008. His M.S. and Ph.D. from the School of Industrial and Labor Relations at Cornell University is in organizational behavior, with a minor in human resource studies.

This dissertation is dedicated to my loving wife who has supported me throughout my academic career and to my parents and parents-in-law who have encouraged me to pursue my dream.

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CHAPTER 1

INTRODUCTION

Since March (1991) introduced the notion of exploitation and exploration, organizational scholars have been seeking the best way for firms to achieve a balance between the two (He & Wong, 2004; Gibson & Birkinshaw, 2004; Im & Rai, 2009; Jansen, Bosch, & Volberda, 2005; Jansen, Templeaar, Bosch, & Volberda, 2009; Kyriakopoulos & Moorman, 2004; Lubatkin, Simsek, Ling, & Veuga, 2006; Cao, Simsek, and Zhang, 2010). This is because the long-term success of a firm depends on its ability to respond to the challenge of both exploiting current competencies and exploring new ones for the future (Duncan, 1976; Gibson & Birkinshaw, 2004; Tushman & O'Reilly, 1996). Levinthal and March (1993) defined ambidexterity as an organization's ability to "engage in enough exploitation to ensure the organization's current viability and to engage in enough exploration to ensure future viability" (p 105). Organizational ambidexterity, thus, enables firms to have competitive advantage over time.

Research on the organizational ambidexterity has diffused and hundreds of empirical studies and theory papers have been published. Research on organizational ambidexterity has focused on the conceptualization of organizational ambidexterity, strategies to achieve it, its effects, and the roles and characteristics of the top management team (TMT) which enable it. The positive relationship between organizational ambidexterity and firm success has been empirically supported (Katila & Ahuja, 2002; Gibson & Birkinshaw, 2004, He & Wong, 2004; Hill & Birkinshaw, 2008; Ming, 2010, Uotila, Maula, Keil & Zahra, 2009). The question that remains is how organizations can best become ambidextrous and achieve a balance between exploration and exploitation activities.

Regarding strategies to achieve balance, four distinctive ways have been suggested (i.e., structural separation, contextual ambidexterity, temporal separation, and domain separation). These four approaches have different theoretical backgrounds and mechanisms to achieve balance and place different emphasis on the roles played by different kinds of employees. Across all four approaches, the

characteristics of top management teams (TMT) and CEOs have been widely studied as key factors to enable an organization to be ambidextrous (Tushman & O'Reilly, 1997; Smith & Tushman, 2005; Lubatkin et al., 2006, Jansen et al., 2009). But there is conceptual disagreement and relatively little empirical work that helps with understanding of ambidexterity at the individual level and the roles and characteristics of middle managers in ambidextrous organizations (Mom, Van den Bosch, & Volberda, 2009; Raisch & Birkinshaw, 2008). Put differently, current research provides rich theoretical and empirical support for ambidexterity research at the organizational level. However, little research has supported how exploration and exploitation are executed and how the assignment of these activities (exploration, exploitation, or both) influences individuals. In addition, the investigation of ambidexterity at the individual level has been suggested as a promising and little-explored dimension in the ambidexterity literature (Gupta et al., 2006; Raisch & Birkinshaw, 2008).

It is important to understand ambidexterity at the individual level. First, not all organizations have resources to have separate units for exploration and exploitation. Thus, individuals are key actors in implementing exploration and exploitation in organizations which do not have separate units (Duncan, 1976; Floyd & Lane, 2000; Tushman & O'Reilly, 1996). Second, organizations can have ambidextrous individuals by giving them the opportunity to manage or implement exploration and exploitation. In order to understand ambidexterity at the individual level, we need to understand the meaning of ambidexterity, the antecedents of ambidexterity, and the effects of ambidexterity at the individual level.

1.1 Research Aim and Questions

This dissertation intends to address the following research questions: 1) what is ambidexterity at the middle manager level, 2) what kinds of managers get different types of work assignments, and 3) what are the consequences of different work assignments.

A few studies have tried to investigate ambidexterity at the middle manager level (Birkinshaw & Gibson, 2004; Floyd & Lane, 2000; Mom et al., 2009; Raisch et al., 2009). Floyd and Lane (2000)

suggested that ambidextrous middle managers need to resolve the conflict between the stabilization of managerial behavior for current strategies and the development of behaviors for new strategies. Mom and colleagues (2009) defined ambidexterity at the manager level as "a manager's behavioral orientation toward combining exploration and exploitation related activities within a certain period of time" (p. 812).

These existing studies on middle manager ambidexterity focus on finding characteristics of ambidextrous managers and contexts which positively influence managers' ambidexterity. However, little research has investigated the antecedent of ambidextrous managers. Put differently, we need to understand who gets ambidextrous work assignments. Several organizational factors have been suggested to facilitate middle manager ambidexterity. For example, a manager who acquires top-down and bottom-up knowledge flows or top-down and horizontal knowledge flows is more likely to undertake the higher levels of both exploration and exploitation (Mom et al., 2007). A manager who has both a short-term and a long-term orientation is more likely to be ambidextrous (O'Reilly & Tushman, 2004; Probst & Raisch, 2005).

In addition, a manager's decision-making authority and the personal coordination mechanisms (i.e., the participation of a manager in cross-functional interfaces and the connectedness of a manager to other organization members) have a positive impact on manager's ambidexterity (Mom et al., 2009). Smith and Tushman (2005) argued that managers need to have paradoxical thinking to effectively manage exploration and exploitation. Although these studies revealed the characteristics associated with managers' ambidexterity, they do not provide a reason why some are successful and others not in becoming ambidextrous. Early work by Cohen and Levinthal (1990) lends some possible insight. They found that prior related knowledge with a breadth of prior knowledge categories helped individuals to be ambidextrous. This suggests that experience may be related to ambidexterity. In line with this study, I suggest the first research question:

1. *What is the relationship between experience and individual ambidexterity?*

Scholars in the ambidexterity literature have been working on conceptualizing individual ambidexterity, developing the scale to measure individual ambidexterity, and finding conditions positively associated with individual ambidexterity (Gibson & Birkinshaw, 2006; Mom et al., 2009). A majority of studies assumes that organizational ambidexterity is achieved based on the implementation of the given exploration and exploitation activities by non-managerial individuals or middle managers (e.g., Gibson & Birkinshaw, 2006; O'Reilly & Tushman, 2008; Probst & Raisch, 2005). But surprisingly, little attention has been paid to the relationship between ambidextrous individuals and their individual outcomes.

Exploration and exploitation may be differently interpreted by the actors in different hierarchal levels. At the strategic level, top managers make decisions to pursue a balance between exploration and exploitation to gain competitive advantage (Levinthal & March, 1993). Top managers perceive exploration as risky and uncertain and exploitation as less risky and certain. The two activities are also seen as different tasks which individuals are assigned to at the operational level. Exploration can be perceived as a challenging task that provides the opportunity to learn and to be motivated. At the same time, exploration is deemed to be a risky and uncertain task. On the other hand, exploitation can be interpreted as a less-challenging task that is also a less-risky and more certain task. Given the differences in both challenge and risk, it seems likely that the way the activities (exploration, exploitation, or both) are assigned to individuals may influence their motivation, attitude, and learning experience. Following the logic of work experience theory, these differences in motivation, attitude, and learning likely lead to different individual outcomes (Tesluk & Jacob, 1998). To examine this relationship, I pose the following research question:

2. *How does the assignment of ambidextrous activities (both exploration and exploitation) influence individual outcomes such as individual and project performance?*

Although there is broad agreement that ambidextrous individuals are a key component to build organizational ambidexterity (Gibson & Birkinshaw, 2006; Mom et al., 2009; O'Reilly & Tushman, 2008), there is a lack of conceptual clarity regarding who are ambidextrous individuals at the operational level. Mom et al. (2009) were first to define an ambidextrous manager. Their definition was based on behavioral orientation toward exploration and exploitation within a certain period time. However, they do not provide the specific ways for managers to become ambidextrous. Gibson and Birkinshaw (2006), drawing upon their conceptualization of contextual ambidexterity, suggest that individuals can be ambidextrous by executing both exploration and exploitation simultaneously. On the other hand, a sequential assignment of exploration and exploitation to individuals within a certain period of time is a plausible alternative way (Duncan, 1976; Venkatraman et al., 2007). Individuals could become ambidextrous by working from exploration to exploration or vice versa. The two ways of an ambidextrous work assignment (simultaneous versus sequential) differ in terms of tensions or contradictions, and in turn, the effects of the two elements on individual outcomes are different.

In addition, considering the opposing characteristics of exploration and exploitation, the sequence of the assignment of ambidextrous work may influence ambidextrous individuals differently. For example, individuals may perceive high levels of ambiguity and complexity of exploration after experiencing exploitation work. To clear up the conceptualization and operationalization of ambidextrous work assignments, I suggest the following research question:

3. *What is an effective way to assign ambidextrous work to individuals?*

1.2 Outline of the Study

This dissertation consists of six chapters. Chapter 1 introduces the dissertation, providing the purposes and key research questions. Chapters 2 and 3 provide the theoretical background. In Chapter 2, I review the current literature on exploration, exploitation, and ambidexterity at the firm level and point out

gaps to position this study. In the Chapter 3, the roles and behaviors of individuals at three levels (i.e., top, middle, and non-managerial level) in an ambidextrous organization are delineated to point out the importance of middle managers and individuals at the operational level. The literature review on ambidexterity and work experience provides a theoretical background for individual ambidexterity. Chapter 4 elaborates the research setting and methods for this study, including the empirical setting, data collection procedures, and a detailed description of key variables. I propose hypotheses and provide results for them in Chapters 5. In Chapter 5, hypotheses are developed to investigate the antecedents and outcomes of ambidexterity at the individual level using individual performance and to clarify the effective way to assign ambidextrous work. In Chapter 6, I discuss the findings of this dissertation, theoretical and practical implications, and limitations and future studies.

CHAPTER 2

LITERATURE REVIEW

In this chapter, I review literature in order to place this study in context, reveal its importance, and clarify the central construct of ambidexterity at the individual level. In addition, this chapter provides the theoretical background for the hypotheses. Section 2.1 introduces the basic concepts of exploitation, exploration, and ambidexterity. Section 2.2 gives a comprehensive overview of the literature based on studies of exploration and exploitation and ambidexterity in diverse fields. This literature review provides a clear understanding of the key construct ambidexterity, antecedents of ambidexterity, the effect of ambidexterity, and gaps in this field. In the following section, the two main approaches (structural separation and contextual ambidexterity) to achieve ambidexterity are compared in order to understand how integration and differentiation of exploration and exploitation occur in the two approaches.

2.1 Introduction to Exploration, Exploitation, and Ambidexterity

Definitions of Exploration, Exploitation, and Ambidexterity

It has long been thought that an organization's ability to exploit its current capabilities and to explore new ones simultaneously enables that organizations' sustainability (Levinthal & March, 1993; March, 1991). March's (1991) definitions of exploitation and exploration were proposed in terms of learning activities to enhance an organization's competitive advantage. Exploration is associated with "search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation," whereas exploitation refers to activities such as "refinement, choice, production, efficiency, selection, implementation, and execution" (p.102). Although Levinthal and March (1993) limited the definitions of exploration and exploitation to organizational learning, subsequent studies expanded the scope of exploration and exploitation to include organizational adaptation (Brown & Eisenhardt, 1995; Leana & Barry, 2000; Miller & Friesen, 1984; Probst & Raisch, 2005; Tushman & Romanelli, 1985; Volberda,

1996), strategic management (Burgelman, 1991; 2002), organizational design (Burns & Stalker, 1961) and technological innovation (Abernathy & Clark, 1985; Dewar & Dutton, 1986; Tushman & Anderson, 1986). Exploration has been defined as transformation, an autonomous strategic process, flexibility and radical innovation, whereas exploitation has been defined as stability, an induced strategic process, efficiency, and incremental innovation.

Although the concepts of exploration and exploitation have been defined, it is challenging to empirically distinguish exploration from exploitation due to the multidimensionality of knowledge (Lavie et al., 2010; Li, Vanhaverbeke, & Schoenmakers, 2008). There are two dominant ways to conceptualize the two. One dimension of knowledge is content. Exploitation is defined as knowledge built on that which an organization already knows, whereas exploration involves a move away from an organization's current knowledge and skills (Cao et al., 2009; He & Wong, 2004; Jansen et al., 2009; Tushman & O'Reilly, 1996). Although many studies have operationalized exploration and exploitation as separate activities, a distinction between the two activities is conceptually made by degree rather than kind (Lavie et al., 2010). This implies that there is a discrepancy between conceptualization and operationalization of exploration and exploitation. Most empirical studies have operationalized the two by kind, although it is desirable to operationalize them by degree (Cao et al., 2010; He & Wong, 2004; Gibson & Birkinshaw, 2004; 5; Jansen et al., 2009; Lubatkin et al., 2006).

The other dimension of knowledge is the knowledge creation process. Three steps for creating value have been used to conceptualize exploration and exploitation (Li et al., 2009). Some operationalized research as exploration and technology (development) as exploitation (Garcia et al., 2003; Geiger & Makri, 2006). Others operationalized technology as exploration and product or market as exploitation (Gilsing & Nooteboom, 2006). Given these differences, there is much room to advance the conceptualization of exploration and exploitation. That said, there is widespread agreement that exploration and exploitation activities are distinct from one another and opposing each other.

Trade-offs between Exploration and Exploitation

The opposing characteristics of exploration and exploitation cause tensions between the two activities. Several reasons have been indicated for these tensions. First, exploration and exploitation generate divergent organizational outcomes and organizations make decisions on allocating resources to exploration or exploitation based on their preference for the different outcomes of the two activities. Exploration helps firms to search for new capabilities and to enhance their survival and long-term performance (Levinthal & March, 1993). However, the chance of a payoff from exploration is uncertain compared with that from exploitation. Thus, the uncertain long-term performance from exploration can lead to a vicious cycle in which failure of exploration results in more exploration (Levinthal & March, 1993). On the other hand, exploitation contributes to short-term performance by increasing efficiency and improving adaptation to the current environment and by decreasing variance (Levinthal & March, 1993). However, high efficiency and reduced variation might become organizational liabilities that inhibit firms from adapting to new environments. Organizations need to consider their strategy, position in the market, and market competitiveness when they allocate limited resources to exploration or exploitation (Christensen & Bower, 1996; Levinthal & March, 1993; March, 1993).

Another reason for tensions between exploration and exploitation is that exploration and exploitation involve significantly different organizational strategies and demand different organizational characteristics such as structure, culture, and leadership style. Organizations pursuing innovation growth are more likely to focus on exploration and to have an adaptive and loose structure (e.g., a decentralized organic structure) and a high autonomy culture (Burgelman, 2002; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). On the other hand, organizations which have the goals of maximizing efficiency and incremental innovation (Tushman & O'Reilly, 1996) are more likely to utilize exploitation and to have a mechanistic structure and a low risk-taking culture (Beckman, 2006; Burgelman, 2002; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). Organizational strategies and characteristics which stimulate exploration usually hamper exploitation and vice versa. In sum, tensions are created when limited

resources are allocated to exploration and exploitation which generate divergent organizational outcomes.

The Balance between Exploration and Exploitation

Organizations pursue a balance between the different demands of exploration and exploitation to ensure short-term and long-term performance (March, 1991; Siggelkow, 2003; Smith & Tushman, 2005; Tushman & O'Reilly, 1996; Venkatraman et al., 2007). However, a balance between exploration and exploitation is difficult to achieve due to the contradictions or tensions between the two activities. March (1991) argued that balancing exploration and exploitation is challenging in that their outcomes are different in terms of viability and timing. There is little agreement on how to achieve a balance between the two activities, although scholars agreed that there are benefits to such a balance (Adler et al., 1999; Lavie et al., 2010).

Previous research has suggested three ways by which a firm can internally achieve a balance between exploration and exploitation: contextual ambidexterity, structural separation, and temporal separation (for review Lavie et al., 2010)[1]. Contextual ambidexterity manages the tensions between exploration and exploitation by allowing individuals to allocate time and energy to the two activities while top managers build a context which supports individuals (Gibson & Birkinshaw, 2004). Structural separation enables organizations to separate exploration and exploitation activities into different organizational units to cope with their different demands (Cao et al., 2009; He & Wong, 2004; Jansen, et al., 2009; Tushman & O'Reilly, 1996; Tushman et al., 2003). Temporal separation achieves a balance between exploration and exploitation by cycling between the two. Thus, the tensions are managed by placing exploration and exploitation in different times, not in different units. I will discuss advantages and disadvantages of these different approaches in detail in the next section.

[1] Lavie et al. (2010) suggested a fourth way -- domain separation -- as another alternative to achieve organizational ambidexterity. With domain separation, organizations specialize in either exploration or exploitation in certain organizational domains while balancing the two activities across domains. Domain separation resolves the tensions between exploration and exploitation by externalizing either one or the other (Lavie & Rosenkopf, 2006; Rothaermel & Deeds, 2004). Because the focus of this study is internal to a single organization, I omit this fourth way.

2.2 – Literature Review

I conducted an extensive review of the literature in management, strategy, organizational behavior, and marketing. Sixty four empirical articles were identified and reviewed. These articles were drawn from a few previous reviews of the exploration and exploitation literature and the ambidexterity literature, as well as, my own search and others between 2002 and 2012. These 64 studies were conducted in a diverse range of fields (e.g., organizational design, organizational learning, technological innovation, strategy, leadership [top management team], and contingency theory).

I categorized the topics as 1) the concepts, which focused on the conceptualization, operationalization or antecedents of ambidexterity or exploration and exploitation, 2) the effects, which investigated the relationship between ambidexterity or exploration and exploitation and their outcomes, and 3) moderators, which explained contradictory findings with regard to organizational ambidexterity. I will review studies in each topic in the ambidexterity and exploration and exploitation research.

Exploration and Exploitation

Among studies of exploration and exploitation, eight concentrated on clarification of the concepts of the two. Danneels (2002) suggested a typology of exploration and exploitation using two dimensions: technology and customers. He argued that product innovation requires two dimensions, technological competences and customer competences, and suggested four types of product innovation: pure exploration, customer competence leveraging, technology competence leveraging, and pure exploration. He provided a dynamic and path-dependent view of product innovation using these four types of innovation. Holmqvist (2003) investigated the relationship between exploration and exploitation and proposed that the two activities reinforce each other, and that transformations occur between them. This study is the first to investigate the relationship between exploration and exploitation.

Gupta et al. (2006) suggested that exploration and exploitation can be conceptualized as two ends of a continuum or as orthogonal variables. They argued that the choice of conceptualization depends on the logic or theory. In addition, they also suggested ways to test the impact of exploration and

exploitation when they are operationalized differently. If exploration and exploitation are operationalized as two ends of a continuum, the correct test for the effects of a balance between exploration and exploitation would be a test for an inverted U-shaped relationship between the degree of exploration and organizational performance. On the other hand, if exploration and exploitation are operationalized as orthogonal, the test for the positive effect of the interaction between exploration and exploration on organizational performance would be a correct one.

Isobe et al. (2004) empirically tested the relationship between exploration and exploitation and found that exploitation provided a strong foundation for exploration whereas exploration has little impact on exploitation. Lavie et al. (2010) conducted a thorough review of exploration and exploitation. Although exploration and exploitation have become essential concepts for understanding various behaviors and outcomes within and across organizations, they argued that there is still a debate over the definition of the two activities, and their measurement, antecedents and consequences. They proposed that the conceptualization of exploration and exploitation as a continuum is desirable because this conceptualization fully reflects the trade-off between them.

Lastly, Li, Vanhaverbeke, and Schoenmakers (2008) investigated why exploration and exploitation are interpreted differently. They argued that the various interpretations of exploration and exploitation in the ambidexterity literature were resulted from the different levels of analysis and the substantial differences in the understanding of exploration and exploitation. With regard to different understandings of the two activities, they suggested a new typology by integrating two perspectives (knowledge domain and knowledge creation process) on exploration and exploitation.

A few studies have investigated the distinct effect of exploration and exploitation. In addition, these studies focused on the moderating effect between exploration and exploitation and its outcomes. Ebben and Johnson (2005) found that small firms which pursue either exploration or exploitation outperform small ones which pursue both. Firm size is used as a condition to develop hypotheses. Wang and Li (2008) found that over-exploitation or over-exploration undermines organizational performance,

defining these terms by reference to the optimal level of exploration and exploitation. This negative effect of over-exploration and over-exploitation on organizational performance changes with environmental dynamism. Under high levels of environmental dynamism, over-exploitation becomes more harmful, whereas over-exploration becomes less.

In the context of alliance, the distinct effect of exploration and exploitation on organizational performance was investigated. Product development which starts with exploration alliance predicts products in development, which in turn predicts exploitation alliance, and finally this exploitation alliance predicts products in markets (Rothaermel & Deeds, 2004). Moreover, this product development path is moderated negatively by firm size. As firm size grows, a firm is more likely to withdraw from this product development path. Siren et al. (2012) found that strategic learning mediated the relationship between exploration and exploitation and organizational performance. Strategic learning is defined as an organization's dynamic capability and enables organizations to disseminate, interpret, and implement strategic knowledge (Kuwada, 1998; Thomas et al., 2001). This study also demonstrated that the influence of exploration on strategic learning is moderated by the level of exploitation, meaning that strategic learning is restricted in that it favors exploitation at the expense of exploration.

Six studies investigated antecedents of exploration and exploitation. Bierly et al. (2009) examined the conditions under which organizations pursue exploration and exploitation. They found that technological relatedness, which represents absorptive capacity, negatively influences the use of external knowledge for exploration, indicating that exploratory knowledge is more applicable to exploration. Sidue et al. (2004) suggested that more environmental dynamism, a stronger organization mission, a prospector orientation and larger slack resources are associated with a greater exploration orientation. Quintana and Benavides (2008) found that technological diversification has a stronger effect on exploratory than on exploitative innovative capability. This implies that technological diversification diminishes core rigidities by providing novel solutions. Management style has also been suggested as an antecedent of exploration and exploitation. Dixon, Meyer and Day (2007) found that an authoritarian management style

facilitates exploitation in the first stage of organizational transformation and a participatory management style fosters exploration in the second stage of organizational transformation. This study showed that the stage of organizational transformation moderates the relationship between management style and the two types of learning activities. In the inter-organizational alliance context, three key factors (i.e., opportunity available to the acquirer firm, ability of the acquirer firm to integrate, and extent of control of target firm post-acquisition) enhance a firm's ability to explore (Phene et al., 2012). In addition, target technological uniqueness is beneficial to the acquirer's exploration and harmful to the acquirer's exploitation.

In summary, there is little agreement on the conceptualization of exploration and exploitation. Researchers have used technology, customer (market), or a mixture of both to conceptualize these terms. The mixed results of empirical studies in the exploration and exploitation literature partially come from the different conceptualizations of exploitation and exploitation (Gupta et al., 2006; Lavie et al., 2010). A more precise conceptualization of the two activities is required for a better understanding of the distinct effect of exploration and exploitation on organizational performance and a clarification of the relationship between exploration and exploitation. With regard to antecedents of exploration and exploitation, a few factors were identified to show consistent effects on the two activities. I suspect that these inconsistent results may have been caused by the lack of a clear conceptualization of the two activities.

Ambidexterity

Among studies of ambidexterity, sixteen studies mainly contributed to the development of the concept and operationalization of ambidexterity. Most of them focused on advancing this conceptualization. Raisch and Birkinshaw (2008) were the first to review the concept of ambidexterity. They developed a comprehensive model, integrating diverse literature streams and identified antecedents, moderators, and outcomes of organizational ambidexterity. Simsek (2009) delineated a multilevel explanation of ambidexterity, introducing an input-process-output view of organizational ambidexterity. He distinguished three different views on ambidexterity: structural, behavioral, and realized. The structural and behavioral views focus on the process in which exploration and exploitation are combined,

while realized view is concerned with the outcomes of exploitation and exploration. Simsek et al. (2009) suggested a typology that identified four types of ambidexterity using the structural dimension and the temporal dimension: harmonic, cyclical, partitional, and reciprocal. These four types of ambidexterity were suggested based on the dimension of temporal (simultaneous or sequential) and structural (within independent units or within interdependent units).

Some research focused on a certain type of ambidexterity. For example, Boumgarden, Nickerson, and Zenger (2012) compared ambidexterity with vacillation (temporal ambidexterity) using case studies and suggested that vacillation may lead to better performance than ambidexterity. Gilbert (2006) suggested that structural ambidexterity is a better solution when organizations face competing multiple frames of threat and opportunity.

Some studies provided a different lens for understanding ambidexterity. Eisenhardt and Martin (2000) introduced the concept of dynamic capabilities, which has furthered our understanding of ambidexterity. Crossan and Hurst (2006) adopted an ecological perspective to enhance the concept of ambidexterity. They introduced improvisation as a means to achieve ambidexterity and suggested a multilevel analysis to capture the roles of exploration and exploitation. Cantarello, Martinin, and Nosella (2012) explored how the balance between exploration and exploitation occurs in practice. They proposed that balancing exploration and exploitation is actually achieved by integrating both the operational and strategic levels in the search phase of the innovation process. Smith and Lewis (2011) reviewed the literature on paradox, which is an underlying characteristic of ambidexterity.

Others provided the concept of ambidexterity on different levels and for different operationalizations of ambidexterity. Cao et al. (2009) suggested two different operationalizations of ambidexterity: balanced ambidexterity, measured by the absolute difference between exploration and exploitation and combined ambidexterity, measured by a firm's combined magnitude of exploration and exploitation. They also identified conditions when either the balanced or combined dimension of ambidexterity was more beneficial to a firm's performance, finding that the balanced dimension of

ambidexterity is more helpful to resource constrained firms, whereas the combined dimension of ambidexterity is more beneficial to firms which have access to greater resources.

Lavie and Rosenkopf (2006) proposed a balance between exploration and exploitation across domains using alliances at the inter-organizational level. They found that firms pursue a balance between exploration and exploitation across domains as well as across business units within an organization. Mom et al. (2009) defined a manager's ambidexterity and revealed its organizational antecedents. They were the first to define ambidexterity at the individual level. Smith and Tushman (2005) developed a model which showed how senior leaders and their teams manage strategic contradictions when they execute exploration and exploitation simultaneously.

Scholars in the ambidexterity literature reached agreement that organizational ambidexterity is of benefit to organizational performance. Four distinctive ways also were suggested for organizations to become ambidextrous. However, the notion of balance is still ambiguous (Lavie et al., 2010). Put differently, the appropriate level of balance between exploration and exploitation needs to be clarified. For example, Levinthal and March (1993) proposed that minimal resources are assigned to exploration with all remaining resources invested on exploration. On the other hand, some studies offer a different approach to determining the appropriate level. He and Wong (2004) insisted that organizations should maintain equal proportions of exploration and exploitation to be ambidextrous. Although the optimal level of exploration and exploitation is hard to specify, the relative level of exploration and exploitation is contingent on organizational characteristics and industry conditions.

Seven studies focused on the effect of ambidexterity on organizational performance. He and Wong (2004) found that the interaction between exploration and exploitation innovation is positively associated with sales growth and the imbalance between the two activities is negatively associated with sales growth in a sample of 206 manufacturing firms. They operationalized ambidexterity using both a high level of both activities and the absolute difference between the two. Katila and Ahuja (2002) found that the interaction of search scope (exploration) and depth (exploitation) is positively associated with the

number of new products. Gibson and Birkinshaw (2004) suggested that organizations with high levels of both adaptability and alignment are more likely to perform better, suggesting contextual ambidexterity in a sample of 41 business units from various countries. In the marketing literature, pursuit of both marketing exploration (entrance into new markets) and marketing exploitation strategies has also been shown to improve financial performance of new products (Kyriakopoulos & Moorman, 2004).

Uotila et al. (2009) found an inverted U-shaped relationship between the relative ratio of exploration to exploitation and organizational performance with data covering the years 1989-2004 for 279 manufacturing firms in the 1989 *Standard & Poor's* 500 index. They were the first to test the effect of ambidexterity on organizational performance using the operationalization of exploration and exploitation as a continuum. A few studies tried to provide the positive effect of ambidexterity on firm survival. Ming (2010) investigated the effect of exploration on firm survival and found that a moderate overlap between exploration and exploitation ensured the longest longevity. Hill & Birkinshaw (2012) found that venture units which developed ambidextrous orientation are more likely to survive.

Studies in the ambidexterity literature have shown that organizational ambidexterity leads to high performance and helps organizations survive longer. However, the little agreement on operationalization of ambidexterity undermines the consistent results of these empirical studies. There should be a consensus on the conceptualization and operationalization of ambidexterity in order to provide consistent and reliable empirical evidence of the effect of organizational ambidexterity.

Fifteen studies focused on antecedents of ambidexterity. Raisch and Birkenshaw (2008) suggested that structure, context, and leadership are three organizational antecedents of ambidexterity. A large portion of studies among these fifteen investigated the top managers' role in achieving ambidexterity. This implies that top managers play an important role in building an ambidextrous organization. These studies concentrated on characteristics of top managers or the TMT to enable an organization to be ambidextrous. The key characteristics are the CEO's network extensiveness (Cao, Simsek, & Zhang, 2010), the TMT's behavioral complexity (Carmeli, Abraham & Halevi, 2009),

transformational leadership (Jansen et al., 2009), and the integration mechanisms (Jansen et al., 2009; Lubatkin et al., 2006; O'Reilly & Tushman, 2008). Six studies proposed other antecedents of ambidexterity: founding team composition (Beckman, 2006), context (Gibson & Birkinshaw, 2004), social relations (Jansen et al., 2005), internal variety (Kim & Rhee, 2009), market orientation (Kyriakopoulos & Moorman, 2004), and culture (Nemanich & Vera, 2009). Although many studies referred to structural antecedents of ambidexterity, most of them did not test the relationship between structural separation and ambidexterity. Only one study directly tested this relationship empirically (Jansen et al., 2009).

In a review by Raisch and Birkinshaw (2008), three antecedents were suggested: structural, contextual, and leadership-based. Four ways to accomplish organizational ambidexterity have also been suggested (Lavie et al., 2010). Each antecedent of organizational ambidexterity and each path to organizational ambidexterity has been studied separately. However, I argue that multiple ways of balancing exploration and exploitation can co-exist in a single organization because even in a structurally separated organization, managers in an exploration unit need to handle exploitation activities in the stage of transfer from exploration to exploitation. Therefore, the three antecedents contribute to achieving organizational ambidexterity in more complex way. Put differently, the three antecedents interact or work together to build organizational ambidexterity.

In sum, research on organizational ambidexterity has focused on substantiating the concept of ambidexterity, identifying antecedents of ambidexterity, and noting the effect of ambidexterity on organizational performance. Mechanisms to enable organizational ambidexterity have been primary concerns, with an emphasis on the role of top managers or the TMT. Little research has been done to investigate how exploration and exploitation operate, the impact of exploration, exploitation, or both on organizational outcomes and individual (middle manager and non-managerial individual) outcomes, and how these outcomes are influenced by organizational characteristics such as structure and context. Specifically, middle managers and non-managerial individuals are regarded as inactive and merely

execute given activities which are exploration, exploration, or a mixture of both. However, I argue that middle managers and non-managerial individuals are important resources in enabling organizational ambidexterity. (In this dissertation, I will focus on middle managers' role) To recognize the importance of middle managers, I will clarify their roles by delineating the internal process needed to achieve structural and contextual ambidexterity in the next chapter and provide a theoretical support for ambidexterity at the individual level.

2.3 – Comparison between Structural and Contextual Ambidexterity

To identify middle managers and non-managerial individuals' roles in achieving structural and contextual ambidexterity, we need to understand how the two approaches are different. In the literature review section, I introduced three ways for a firm to achieve organizational ambidexterity. Both temporal separation and structural ambidexterity try to achieve balance between exploration and exploitation through structural means. Broadly speaking, the mechanism to achieve balance between the two is similar. Therefore, I will compare structural and contextual ambidexterity to provide a theoretical background for the roles of middle managers and non-managerial individuals.

Structural and contextual approaches to achieve organizational ambidexterity are distinguished in several ways. First, they originate from different theoretical backgrounds. Thus, the two approaches suggest different mechanisms to enable organizational ambidexterity and different challenges that organizations should overcome. In the structural approach, researchers have focused on organizational design (structure). Organizations become ambidextrous by differentiating exploration and exploitation through structural separation and this differentiation is complemented by integration of the two activities (He & Wong, 2004; Jansen et al., 2005; Tushman & O'Reilly, 1996). On the other hand, in the contextual approach, researchers have emphasized the role of context or culture. Organizational ambidexterity is achieved by building a context or culture that supports the involvement of middle managers and non-managerial individuals in both differentiation and integration of exploration and exploitation (Gibson & Birkinshaw, 2006). Second, the two approaches have different assumptions for top managers, middle

managers and non-managerial individuals. In the structural approach, top managers (and some middle managers) are expected to handle strategic contradictions (cognitive contradictions) that come from their engaging in both differentiation and integration of exploration and exploitation (Jansen et al., 2005; Smith & Tushman, 2006). Middle managers and non-managerial individuals are expected to fulfill their given tasks, which are either exploration or exploitation (Tushman & O'Reilly, 1996). In contextual ambidexterity, middle managers and non-managerial individuals execute both exploration and exploitation activities under the context or culture that top managers build (Gibson & Birkinshaw, 2004). This implies that middle managers and non-managerial individuals are ambidextrous in contextual ambidexterity (Gibson & Birkinshaw, 2004).

Structural ambidexterity has been regarded as the primary solution to achieve organizational ambidexterity (Cao et al., 2009; He & Wong, 2004; Jansen et al., 2009; Tushman & O'Reilly, 1996). Duncan (1976) suggested the ambidextrous organization as an alternative to execute exploration and exploitation. His main argument was that exploration and exploitation operated separately (structural separation) because people are essentially noninnovative. Thus, organizations need to be designed to be innovative. For example, organizational characteristics which facilitate the initiation and implementation of innovation are different. Organizations need strategic responsiveness in the initiation stage and capability to cope with operating problems in the implementation stage. Three organizational characteristics (i.e., complexity, formalization, and centralization) are significantly different in the two stages of innovation. Finally, individuals are assigned to either the initiation or implementation stage.

Structural separation of exploration and exploitation units ensures that each unit retains the specific capabilities needed to meet the specific and conflicting demands of exploration and exploitation (Gilbert, 2005). Moreover, structural separation is complemented by top managers' integration activities to align exploration and exploitation with organizational performance (Lubatkin et al., 2006). This approach recognizes the importance of the congruence between organizational structure and internal (task) and external (environment) demands (Burn & Stalker, 1961; Duncan, 1976, Lawrence & Lorsch, 1967).

A large portion of studies has provided evidence to support a positive relationship between structural ambidexterity and organizational performance (Cao et al., 2009; He & Wong, 2004; Jansen et al., 2005; Jansen et al., 2009; Tushman & O'Reilly, 1996). The balance achieved by structural separation is positively related to firms' performance as indicated by measures such as sales growth (He & Wong, 2004). However, most of the studies assumed structural separation as the way to achieve balance between exploitation and exploration. They did not investigate the relationship between structural separation and organizational ambidexterity empirically. Only Jansen et al. (2009) made such a test. They found that structural differentiation has a positive relationship with organizational ambidexterity and that this relationship is moderated by the informal senior team's and formal organizational (i.e., i.e., senior team social integration and cross-functional interfaces, respectively) integration mechanisms. In sum, structural separation allows the coexistence of conflicting exploratory and exploitative efforts to meet the different demands of existing and new customers or markets, leading to high organizational performance.

Contextual ambidexterity is rooted in the organizational context and culture literature (Burgelman, 1991; Ghoshal & Bartlett, 1994). Gibson and Birkinshaw (2004) described organizational context as a mixture of the structure context[2], culture, and climate. Such a context, which is represented by systems, processes, and beliefs, shapes individual behaviors. Thus, contextual ambidexterity depends primarily on individual capabilities to execute exploration and exploitation activities. Although Gibson and Birkinshaw (2004) were the first to suggest the concept of contextual ambidexterity, their argument was linked to several previous studies. Adler et al. (1999) found four kinds of mechanisms to overcome efficiency and flexibility tradeoffs and to achieve both greater efficiency and flexibility: meta-routines, enrichment, switching, and partitioning. Among these four mechanisms, two are seen to enable individuals to make decisions that can reconcile tensions between efficiency and flexibility. Meta-routines refer to the systemization of the creative process for both incremental and radical innovation. Enrichment

[2] Gibson and Birkinshaw (2004) defined structural context as "the establishment of administrative mechanisms that foster certain behaviors in employees, but its emphasis is on relatively tangible systems and processes such as incentive or career management systems, rather than on more intangible attributes such as a system's capability to stretch employees" (p.212).

allows workers' tasks to include non-routine tasks as well as routine. In addition, Adler et al. (1999) pointed out that trust and training are key contextual factors that facilitate ambidexterity, arguing that structural aspects of ambidexterity are complimented by organizational context.

Contextual ambidexterity is designed to encourage employees to allocate time and energy to different demands of exploitation and exploration (Gibson & Birkinshaw, 2004). Specifically, Gibson and Birkinshaw (2004) suggested that managers are expected to create contexts, a mixture of stretch, discipline, support, and trust, to support individuals in meeting conflicting demands. They found that the hard elements (discipline and stretch) and the soft elements (support and trust) were balanced in successful organizations. While Gibson and Birkinshaw (2004) discussed the role of employee autonomy in decision-making, they also put an emphasis on the importance of the TMT in creating contexts that support ambidexterity. They also pointed out that managers used complex behavioral repertoires in contextual ambidexterity (Denison et al., 1995). Unlike structural separation, contextual ambidexterity is more sustainable and can avoid coordination problems, although it takes a much longer time to build contextual ambidexterity than structural ambidexterity (Gibson & Birkinshaw, 2004). In sum, contextual ambidexterity enables organizations to be ambidextrous by developing a context that supports individual capabilities in managing both exploration and exploitation.

An important difference between structural ambidexterity and contextual ambidexterity is in how they view the roles of managers and workers below the level of the top management team. When ambidexterity is achieved structurally – through an organizational design that has separate units devoted to exploratory activities and exploitative activities – only the top management team sees the tensions and conflicts. When ambidexterity is achieved contextually all employees are potentially faced with tensions and contradictions in their day-to-day activities. In a contextually ambidextrous organization all employees might need to decide whether to devote time and attention to exploratory activities versus exploitative activities. Thus it is essential to develop a deeper understanding of ambidexterity at the individual level. In the next chapter I begin to develop a framework that describes the role of top-

managers, middle-managers, and individual contributors in both structurally ambidextrous organizations and contextually ambidextrous organizations.

CHAPTER 3

AMBIDEXTERITY AT THE INDIVIDUAL LEVEL

In this chapter, I provide a theoretical background for ambidexterity at the individual level. Section 3.1 focuses on revealing the roles of top managers, middle managers, and non-managerial individuals. Identification of roles in the different levels in an organization helps us compare the distinct roles of each level. In my empirical work, I will specifically focus on middle managers as a first step to better understand ambidexterity at the operational level. Section 3.2 provides the theoretical background for the notion of ambidextrous individuals and the effect of the assigning of exploration and exploitation activities to individuals. In this section, I will provide the definition of an ambidextrous individual in detail.

3.1 – Roles of Top Managers, Middle Managers, and Non-Managerial Individuals in Ambidextrous Organizations

Lawrence and Lorsch's (1967) seminal work outlined the complementary roles of differentiation and integration as mechanisms for organizations to accomplish effective results. They proposed that high levels of both differentiation and integration in subunits will help organizations adapt to environmental changes and ultimately deliver better outcomes. Differentiation is defined as "the segmentation of the organization into subsystems which each tend to develop particular attributes in relation to the requirements posed by it in the relevant subsystems" (p. 4). In line with Lawrence and Lorsch's definition, researchers who study structural ambidexterity suggested that differentiation enables organizations to cope with inconsistent demands of exploration and exploitation (Gilbert, 2005; O'Reilly & Tushman, 2008). On the other hand, Lawrence and Lorsch (1967) defined integration as "the process of achieving unity of effort among the various subsystems to accomplish the organization task" (p. 4). In the ambidexterity research, integration is defined as a behavior mechanism used to permit organizations to

deal with exploration and exploitation within the same unit (Raisch et al., 2009). The strategic integration of the TMT, including sharing a vision, having a common set of values, and employing overarching governance processes, is required to bring together the contrasting demands of exploitation and exploration (Tushman & O'Reilly, 1996; Smith & Tushman, 2005). Integration in the ambidexterity literature was suggested as an alternative to differentiation or a facilitator of processes relating to the different needs of exploitative and exploratory activities.

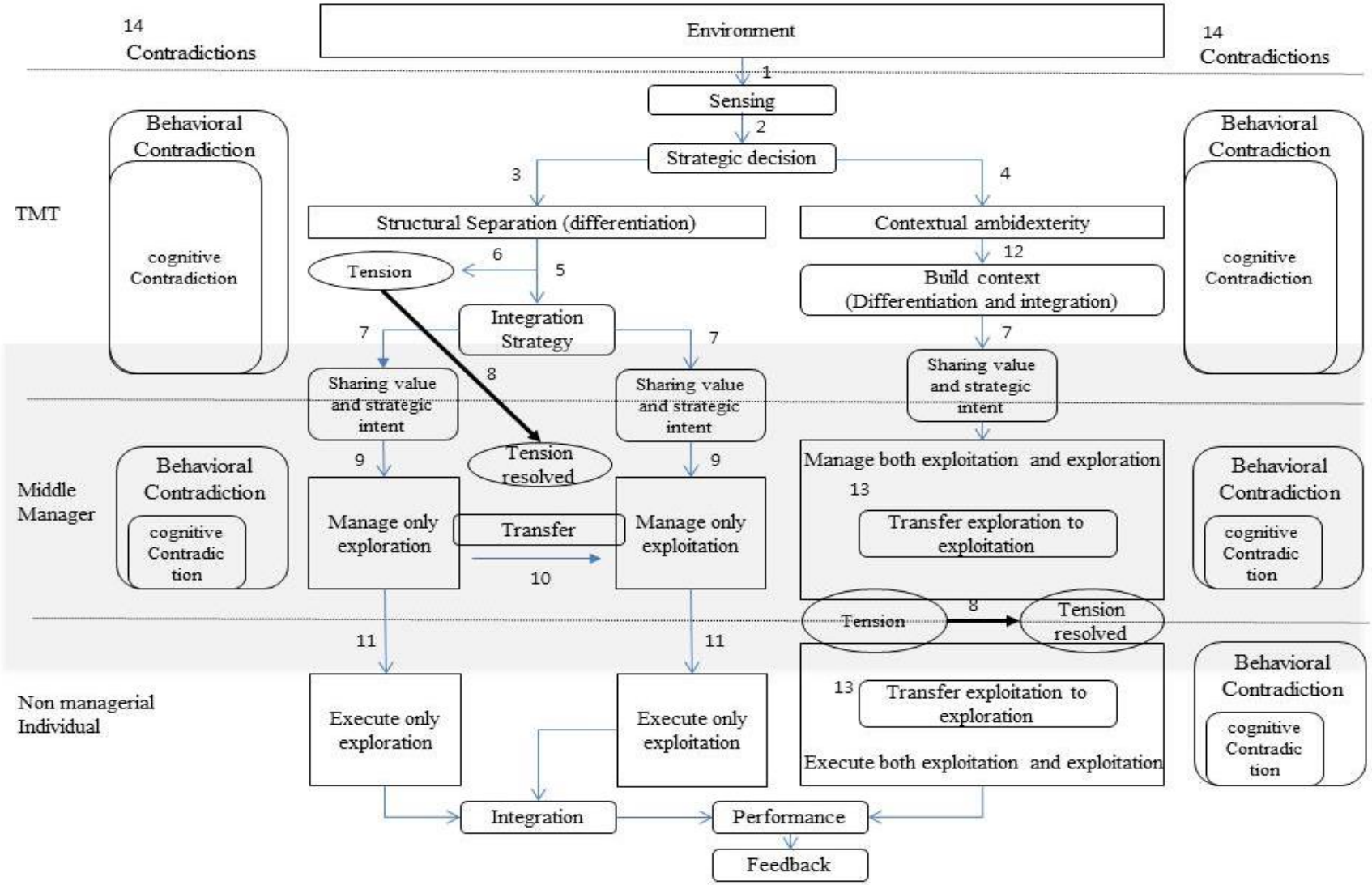
Among three ways (i.e., structural ambidexterity, contextual ambidexterity, and temporal separation) to achieve organizational ambidexterity, the structural approach tries to achieve a balance by splitting exploration and exploitation into different units, domains, or times. Thus, each unit or domain is expected to be configured to meet the specific requirement of its task environment (Lawrence & Lorsch, 1967). Such differentiation enables each unit or domain to develop different competencies to cope with different demands of exploration and exploitation (Gibert, 2006). On the other hand, several researchers suggested leadership as an important factor to enable an organization to become ambidextrous. The leadership approach investigated the role of senior executives to foster a balance between the two activities (Jansen et al., 2009; Lubatkin et al., 2006; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). Most of the studies described the integrative leadership behavior to support such a balance as top management team characteristics (Cao et al., 2010; Carmeli & Halevi, 2009) and leadership style (Jansen et al., 2008; Jansen et al., 2009; Lubatikin et al., 2006). The contextual approach helps organizations reach a balance by cultivating an organizational context that is a combination of stretch, discipline, support, and trust, while emphasizing the role of the TMT that builds the context (Gibson & Birkinshaw, 2004). Such a context supports both differentiation and integration between exploration and exploitation activities that are carried out by individuals such as middle managers and non-managerial individuals.

The emphasis on either differentiation or integration has generated criticism of the different approaches (Raisch et al., 2009). Scholars who emphasize integration hold that the different activities of exploration and exploitation should be reunited to contribute to value creation (Eisenhardt & Martin, 2000;

O'Reilly & Tushman, 2008; Teece, 2007). On the other hand, scholars who focus on differentiation condemn the incompleteness of integration by claiming that exploration and exploitation activities which individuals execute constrain integration (Inkpen & Tsang, 2005; March, 1991). However, there is a consensus that integration and differentiation should be viewed as complimentary in achieving organizational ambidexterity (Raisch et al., 2009). This complimentary view is also accompanied by the paradox that integration and differentiation should be handled simultaneously rather than one-by-one or by trade-offs (Eisenhardt & Martin, 2000). If the complimentary view is the case, the combination of differentiation and integration depends on determining the right degree of each (Raisch et al., 2009). Recent understanding of the complementary relationship between differentiation and integration refreshes our views on the ways to achieve organizational ambidexterity (Raisch et al., 2009). Integration (e.g., leadership approach and contextual ambidexterity) and differentiation (e.g., structural ambidexterity and contextual ambidexterity) should be viewed as complementary (Raisch et al., 2009). Therefore, I argue that the structural and contextual approaches are the two main ways to achieve ambidexterity, while each is complemented by leadership approach.

As mentioned in the chapter 2, the two ways of balancing exploration and exploitation have different theoretical backgrounds and mechanisms to reach ambidexterity. These different mechanisms are described in Figure 1. This figure integrates previous studies and describes the detailed process by which organizations become ambidextrous. I delineate 1) the implementation of differentiation and integration of exploration and exploitation 2) the location of contradictions that occur and are resolved 3) management and transfer of exploration and exploitation activities 4) roles of top managers, middle managers, and non-managerial individuals 5) the degree of contradictions that top managers, middle managers, and non-managerial individuals experience.

Figure 1: Roles of TMT, Middle Manager, and Non-managerial Individual and the Process of Becoming an Ambidextrous Organization



Theoretical Background

1. Sensing: sensing opportunities and threats, particularly in rapidly shifting markets, requires scanning, searching, and exploration - O'Reilly and Tushman (2008)
2. Strategic decision: selection of balancing modes – structural separation or contextual ambidexterity - Lavie et al. (2010), O'Reilly and Tushman (2008), Raisch et al. (2009)
3. Structural ambidexterity: the subdivision of tasks into distinct organizational units - He and Wong (2004), Jansen, Tempelaar, Bosch, and Volberda (2009)
4. Contextual ambidexterity: Gibson and Birkinshaw (2004)
5. Integration: the behavioral mechanisms that enable organizations to address exploitation and exploration activities within the same unit – Jansen et al. (2008), Lubatikin et al. (2007), Raisch et al. (2009)
6. Tensions or contradictions: O'Reilly & Tushman (2008), Smith and Tushman (2005)
7. Sharing value and strategic intent: Floyd and Lane (2000), Wooldrige et al. (2008)
8. Tensions are resolved: Raisch and Birkinshaw (2008)
9. Managing only exploration and exploitation: O'Reilly and Tushman (1996)
10. Transfer exploration to exploitation: Lavie et al. (2010)
11. Execution of exploration and exploitation
12. Building context: Gibson and Birkinshaw (2004)
13. Managing and executing both exploration and exploitation: Gibson and Birkinshaw (2004)
14. Contradictions (behavior and cognition) : Denison et al. (1996), O'Reilly and Tushman (2008), Smith and Tushman (2005)

Top managers sense opportunities and threats from environmental change (Teece, 2006). To seize these opportunities and avoid these threats, top managers need to determine how to achieve organizational ambidexterity: contextual ambidexterity or structural ambidexterity (O'Reilly & Tushman, 2008). Ambidexterity achieved by either way requires an alignment of competences, structures and cultures for organizations to be involved in exploration and exploitation.

In structurally ambidextrous organizations, top managers (and some middle managers) are in charge of differentiation by designing organizational structures for different units to engage in either exploration or exploitation (Jansen et al, 2009; Duncan, 1976; Tushman & O'Reilly, 1996). In addition, top managers need to implement integration actions. O'Reilly and Tushman (2008) articulated top managers' actions and processes that reconfigure resources to integrate exploration and exploitation. They suggested three actions and processes: (1) the presence of a convincing strategic intent that explains the importance of both exploration and exploitation, (2) a common vision and values that form a common identity, and (3) a consensus among the top managers about strategic intent. Jansen and colleagues (2008, 2009) also suggested that organizational integration mechanisms help the TMT resolve contradictions caused by pursuing exploration and exploitation simultaneously. Therefore, contradictions in structurally ambidextrous organizations are experienced by top managers. Such contradictions are associated more with cognitive contradictions than with behavioral ones (Andriopoulos & Lewis, 2009; Smith & Tushman, 2005). While top managers manage differentiation and integration of exploration and exploitation, middle managers and non-managerial individuals implement given activities (Lavie et al., 2010). Thus, a balance between the two activities occurs on the organizational level and the involvement of top managers in differentiation and integration is relatively higher than that in contextually ambidextrous organizations.

Another integration mechanism of ambidexterity involves managing the timing of when exploration is to give way to exploitation (Lavie et al., 2010). Although exploration and exploitation generate conflicts and contradictions in terms of the allocation of internal organizational resources at a specific moment, exploration and exploitation reinforce each other over time (Lavie et al., 2010).

Activities of exploration units transfer to exploitation units after the exploration units achieve early market success or test new products successfully (O'Reilly & Tushman, 2008; O'Reilly, Harreld, & Tushman, 2009). This implies that an organization can exploit the opportunities that exploration created (Lavie et al., 2010). From a static perspective, separate units appear to be involved in either exploration or exploitation but not both. From a dynamic perspective, units communicate with each other to transfer exploration knowledge or products to exploitation units.

If top managers choose the contextual approach as a means to achieve ambidexterity, they need to build a context that enables middle managers and non-managerial individuals to differentiate and integrate exploration and exploitation. In contextually ambidextrous organizations, top managers empower middle managers or non-managerial individuals to choose exploitation and exploration (Gibson & Birkinshaw, 2004). Thus, contradictions or tensions created from balancing exploration and exploitation are what middle managers or non-managerial individuals need to manage. For example, Brunner et al. (2009) found that they attributed the management of contradictions within Toyota to the individual ability in that firm.

Contradictions in contextually ambidextrous organizations that middle managers or non-managerial individuals experience are related to behavioral ones that include cognitive ones because such individuals not only perceive their multiple and contradictory roles but also perform them (Denison et al., 1995). Thus, the involvement of top managers in differentiation and integration in contextually ambidextrous organizations is lower than that of top managers in structurally ambidextrous organizations. Organizations pursuing contextual ambidexterity must meet the challenge of how to cultivate capabilities of middle managers or non-managerial individuals to handle contradictions behaviorally and cognitively (Gibson & Birkinshaw, 2004).

The different mechanisms of the two ways of balancing exploration and exploitation require 1) different roles for top managers, middle managers, and non-managerial individuals, and 2) different levels of involvement in differentiation and integration by top managers, middle managers, and non-managerial

individuals. In structurally ambidextrous organizations, top managers play a proactive role in achieving ambidexterity. Top managers design the organizational structure such that exploitation and exploration activities are implemented separately. They also develop overarching strategies and missions for both activities to be integrated for overall organizational performance (O'Reilly & Tushman, 2008). Smith and Tushman (2005) suggested that the effective management of contradictions comes from managers or the TMT's paradoxical cognition, which is defined as "managerial frames and processes that recognize and embrace contradiction" (p.523). Thus, top managers should have the capability to cope with contradictions cognitively and to manage differentiation and integration (some middle managers may play a similar role).

Middle managers and non-managerial individuals take an inactive role in structural separation in that their main role is to accomplish the given tasks. However, as mentioned above, middle managers take the role of determining the timing to transfer exploitation to exploration. In addition, middle managers need to understand the strategic intent of pursuing ambidexterity and the mission and values of their organization. Such strategic intent and values need to be communicated to non-managerial individuals. In sum, middle managers serve in an intermediate position in the organization, linking otherwise disconnected top managers and non-managerial individuals in order to achieve organizational ambidexterity in a structurally ambidextrous organization (Wooldridge, Schmid, & Floyd, 2008).

In contextually ambidextrous organizations, the involvement in differentiation and integration of top managers is relatively less demanding than in structurally ambidextrous organizations (Lavie et al., 2010). The primary role of top managers is to provide contexts, a mixture of stretch, discipline, support and trust (Gibson & Birkinshaw, 2004). By contrast, middle managers and non-managerial individuals are empowered by top managers and manage contradictions between exploitation and exploration. Middle managers and non-managerial individuals might need paradoxical cognition, which has been suggested as a characteristic of top managers that enables them to embrace contradictions (Smith & Tushman, 2005).

In the two approaches for ambidexterity, middle managers play an essential role. In contextually

ambidextrous organizations, middle managers direct both exploration and exploitation activities while fostering the context that top managers build (Gibson & Birkinshaw, 2006; Floyd & Lane, 2000). The importance of middle managers in contextually ambidextrous organizations is explicit. In structurally ambidextrous organizations, middle managers are involved in either exploration or exploitation activities. However, the fact that exploratory activities are gradually transformed into exploitative ones makes the roles of middle managers in structurally ambidextrous organizations more complicated (O'Reilly & Tushman, 2008; O'Reilly, Harreld, & Tushman, 2009). Lavie et al. (2010) pointed out that it is uncertain to what extent top managers can control the transition from exploration to exploitation because such a transition usually occurs at the operational level. This implies that the management of transition from exploration to exploitation is done by middle managers. Middle managers in structurally ambidextrous organizations need to communicate among themselves to smooth the transition from exploration activities to exploitation ones.

I theoretically compared the two approaches of organizational ambidexterity. In previous research, these two approaches have been suggested as an alternative (Jansen et al., 2009; Gibson & Birkinshaw, 2004). However, Lavie et al. (2010) suggested that it is worthwhile to investigate how organizations achieve organizational ambidexterity using multiple strategies. The firm where I conducted research combines contextual and structural approaches (I will delineate this in Chapter 4.). This implies that the role of middle managers in an organization, which uses both methods for organizational ambidexterity, is a more complicated mixture of both approaches. Thus, middle managers take both active and inactive roles in implementing exploration and exploitation. Put differently, some middle managers initiate tasks or implement the given tasks which are exploration, exploitation, or both.

Regardless of the active and inactive roles of middle managers, exploration and exploitation become work assignments when middle managers execute them. If exploration and exploitation are work assignments of the middle managers and non-managerial individuals, we need to understand how the work is assigned and how the assigned work influences individual outcomes. This also relates to the best

way to assign work. Firms strategically assign work to project members and managers to gain higher work performance (Brown & Eisenhardt, 1995). For example, exploration (harder work) is more likely to be assigned to individuals who have higher performance or better capabilities. However, continuous work on exploration may have a negative effect on individual performance. In addition, there is a strong positive relationship between project or individual performance in R&D centers and organizational performance (Adler et al., 1996; Shenhar, 2001). Thus, it is important to understand the way work is assigned and how the assigned work influences individual outcomes.

3.2 – Understanding Ambidextrous Managers at Operational Level

Studies in the ambidexterity literature have focused on how firms achieve organizational ambidexterity. Put differently, most research was done on the strategic level (Mom et al., 2009). In order to understand ambidexterity at the operational level, we also need to understand individual ambidexterity, which is a key construct at the operational level (Tushman & O'Reilly, 2004). The main approach in studies of individual ambidexterity has been to illustrate key characteristics of individuals who have this ability (Mom et al., 2009). In contrast to this approach, this study takes a developmental approach based on work experience theory (Tesluk & Jacobs, 1998). I argue that the assignment of both exploration and exploitation (the assignment of ambidextrous work) makes individuals ambidextrous, while recognizing that managers who have abilities or capabilities are more likely to become ambidextrous. In this section, I will provide theoretical background for ambidextrous managers using this approach.

Until recently, there was little agreement on whether or not individual can be ambidextrous. Scholars who suggested structural separation insisted that individuals do not have the capability to handle the tensions or contradictions which come from executing exploration and exploitation concurrently (Duncan, 1976; O'Reilly & Tushman, 2008). On the other hand, scholars who suggested contextual ambidexterity (Gibson & Birkinshaw, 2006), individual (manager) ambidexterity (Mom et al., 2009), or temporal separation (Venkatraman et al., 2007) proposed that individuals do in fact have capability to

manage the tensions or contradictions between the two activities. According to a recent review (for review Lavie et al., 2010), organizations can pursue diverse strategies to achieve ambidexterity and individual ambidexterity plays an important role in contextual ambidexterity and temporal separation. The focus on individual ambidexterity has moved from whether individuals can be ambidextrous or not to what facilitates individual ambidexterity or outcomes of individual ambidexterity.

A few studies have investigated individual ambidexterity (Gibson & Birkinshaw, 2006; Mom et al., 2008, 2009). Mom et al. (2009) defined ambidexterity at the manager level as "a manager's behavioral orientation toward combining exploration and exploitation related activities within a certain period of time" (p. 812). They constructed a scale to measure a manager's ambidexterity because they were the first to measure ambidexterity at the individual level. Mom et al. (2009) investigated organizational mechanisms to facilitate a manager's ambidexterity from a sample of 716 business-unit level and operational-level managers. They found that formal structural mechanisms (i.e., a manager's decision-making authority) positively related to a manager's ambidexterity, whereas formalization of a manager's tasks was not associated with a manager's ambidexterity. On the other hand, personal coordination mechanisms (i.e., the participation of a manager in cross-functional interfaces and the connectedness of a manager to other organization members) are positively associated with a manager's ambidexterity. In addition, they found positive interaction effects between the formal structural and personal coordination mechanisms on managers' ambidexterity.

Previous studies on ambidexterity at the individual level provided the characteristics of ambidextrous managers. First, such managers play multiple roles and execute multiple, different tasks (Gibson & Birkinshaw, 2004; Floyd & Lane, 2000). For example, ambidextrous managers need to define competence for strategic renewal and to deploy competence as defined by top managers (Floyd & Lane, 2000). Strategic renewal is an evolutionary process to find, adjust, and use new knowledge and innovative action to generate change in an organization's core competencies or to change a firm's product market domain (Burgelman, 1991). Top managers set a strategic direction and empower middle managers to

deploy the competence that top managers define. While middle managers facilitate the implementation of plans to enable non-managerial individuals to achieve strategic renewal, they also try to find alternative competences for strategic renewal and communicate with top managers to renew competencies. Ambidextrous managers conduct both routine and non-routine activities (Adler et al., 1999). Adler et al (1999) found four kinds of mechanisms to overcome efficiency and flexibility tradeoffs, resulting in both greater efficiency and flexibility: meta-routines, enrichment, switching, and partitioning. Routine activities are aimed at increasing efficiency, whereas non-routine activities are designed to escalate flexibility. Sheremata (2000) suggested that managers need to act both creatively and collectively to develop radical new products.

Ambidextrous managers improve and cultivate their knowledge, skills, and expertise (Floyd & Lane, 2000; Hansen et al., 2001; Sheremata, 2000). Floyd and Lane (2000) suggested that managers need to resolve the conflict between institutionalized behavior associated with current competencies and new behavior to encourage strategy renewal. Examples from the literature illustrate that ambidextrous managers engage in both reliability-enhancing and variety-increasing learning activities (Holmqvist 2003, McGrath 2001), process and acquire both explicit and tacit knowledge (Lubatkin et al. 2006), and engage in both local and distant searches for knowledge and information within their network of contacts (Hansen et al. 2001, Subramaniam & Youndt 2005). Cohen and Levinthal (1990) suggested that having prior related knowledge that aids in adjusting to and using new knowledge is essential to becoming an ambidextrous manager.

However, little attention has been paid to outcomes of ambidextrous managers or non-managerial individuals. Previous studies on individual ambidexterity focused on conceptualizing individual ambidexterity, developing a scale to measure individual ambidexterity, and finding conditions that are positively associated with individual ambidexterity (Gibson & Birkinshaw, 2006; Mom et al., 2009). Individual ambidexterity may have a positive impact on individual performance and organizational performance.

Regarding organizational performance, the ways to achieve ambidexterity interact with individual ambidexterity. For example, individual ambidexterity has little effect on organizational performance in a structurally ambidextrous organization because individuals are expected to engage in only exploration or exploitation (Jansen et al., 2009). Thus, individuals do not necessarily have to be ambidextrous to make organizations ambidextrous. On the other hand, individual ambidexterity may have a strong positive impact on organizational performance in a contextually ambidextrous organization or an organization which uses temporal separation because such organizations are highly dependent on individual capabilities to achieve ambidexterity (Gibson & Birkinshaw, 2006).

Regarding individual performance, there is little agreement among researchers in the ambidexterity literature. First, scholars who support structural ambidexterity argued that individuals are not at the root of organizational ambidexterity (Duncan, 1976: O'Reilly & Tushman, 2008). Thus, organizations need to employ separation for individuals to be involved in only one type of activity because the tensions or contradictions between exploration and exploitation are so strong that it is difficult for individuals to manage them (Smith & Tushman, 2005). Second, scholars who support contextual ambidexterity or temporal separation argued that individuals have the capability to handle the tensions between exploration and exploitation. In addition, ambidextrous individuals renew their knowledge, skills, and expertise and are used to playing multiple roles (Floyd & Lane, 2000; Hansen et al., 2001; Mom et al., 2009; Sheremata, 2000). These characteristics enable ambidextrous individuals to perform better than non-ambidextrous ones.

In order to investigate the relationship between ambidextrous individuals and their outcomes, we need to revisit the conceptualization of ambidextrous managers. Among the three ways to achieve ambidexterity discussed in chapter two there are distinct views of mid-level managers and non-managerial individuals. In structural ambidexterity, managers and non-managerial individuals are expected to engage in either exploration or exploitation. On the other hand, when ambidexterity is achieved contextually or temporal separation, organization is highly dependent the capability of

individuals to engage in both exploration and exploitation. In contextually ambidextrous organizations, managers and non-managerial individuals have autonomy in allocating time and energy to accomplish exploration and exploitation. Both exploration and exploitation are performed concurrently. On the other hand, temporal separation requires that organizations cycle between exploration and exploitation. Managers and non-managerial individuals engage in exploration and exploitation in different time domains, but must have the requisite skills and capabilities to do so. This implies that both contextual ambidexterity and temporal ambidexterity provide mechanism by which individuals can become ambidextrous.

In addition to the conceptualization of ambidextrous individuals, we also need to pay attention to the operationalization of ambidextrous managers. Previous studies which investigated ambidexterity at the individual level used cross-sectional and perceptual scales. The use of cross-sectional approach likely generates common method bias and causal reciprocity. They suggested that future studies need to measure ambidexterity at the managerial level using objective measures, and to take a longitudinal approach to reveal the causality between ambidexterity at the managerial level and other variables such as coordination mechanisms and performance of managers. Although it is feasible to use surveys to collect longitudinal data, it is easier to do so using objective data. However, this limitation of survey research methods is not an inherent problem, but a problem with research design choices.

Ambidextrous managers can be operationalized using an objective measure. Past work assignments can be used for the conceptualization of ambidextrous managers. For example, three different types of work assignments can be given to individuals. If only exploration (exploitation) work is assigned to individuals, these individuals can be categorized as having exploration (exploitation) work experience. If both exploration and exploitation works are assigned, individuals can be categorized as having ambidextrous work assignments. These operationalizations can reveal the causality between individuals' work experience and their outcomes due to the availability of much longitudinal data.

CHAPTER 4

RESEARCH SETTING AND METHODS

This chapter describes the research methodology used in this dissertation. Section 4.1 provides the rationale for the selection of the research setting and describes the R&D centers at which the empirical research took place, their industry, and managers' activities. In the next section, the samples and data collection process are elaborated. A detailed description of measures is also provided in this section. More importantly, I provide a detail description of the kinds of work assignments in the R&D centers.

4.1 – Research Setting: Two R&D Centers

LG Electronics

The company where I conducted my dissertation research, LG Electronics, is a leading electronics firm in South Korea. The fields of R&D in this firm are classified into four categories: home entertainment, mobile phones, home appliances, and air conditioners and energy solutions. Major products of home entertainment are TVs, audio, video, and optical storage. This category consists of 35% in terms of sales in 2009. Products of the mobile phones division are mobile handsets and mobile accessories. This category consists of 32% of sales. Home appliances include washing machines, refrigerators, cooking appliances, and vacuum cleaners. This category consists of 17% of sales.

The consumer electronic products, home appliances, and mobile communication devices markets are characterized as rapid technological change. Thus, firms in these industries must continuously develop new products and update existing products to meet its customers' demands. In addition, the markets for these industries are highly competitive. LG Electronics faces competition from large multi-national firms and regional product providers in low-cost markets. To cope with the intense competition, LG Electronics has tried to build strong R&D capabilities. In the period 2008 – 2012, yearly revenue decreased from $26,174 to $23,817 million and net income dropped sharply from $1,760 million to $332 due to difficulty

in the mobile phone industry according to company report by the *Hoovers*.

This firm has the thirty R&D centers around the world. The two central R&D centers located in Seoul are in charge of developing advanced technologies beyond the four business areas. Each main business area has its R&D center. Interviews and archival data collection were done in the mobile phone R&D center and in one of the two central R&D centers. I chose the two R&D centers because they offer opportunities to examine exploration and exploitation in different context. In the firm level, the central R&D centers are in charge of exploration and other R&D centers are in charge of exploitation. However, in the R&D center level, each has its own classification of exploration and exploitation. The detailed description of the two R&D centers will be delineated in the following section.

The Mobile Phone R&D Center

The mobile phone industry offers a good opportunity to investigate how organizations pursue both exploration and exploitation simultaneously at the operational level. The industry has experienced rapid technological innovation, increasing market competition, and globalization. This environment has required firms in the industry to cope with the diverse demands of the global market (e.g., high-end or low-cost) and to be in line with the government policies of different countries (Ahn et al., 2005). These diverse requirements have increased the complexity in the industry. In turn, R&D capability to meet these requirements became a key factor in the success of products in the mobile phone industry. These challenges have forced firms to execute both exploration and exploitation concurrently (Burgelman, 2002; Henisz & Macher, 2004; Iansiti, 2000; Rosenkopf & Nerkar, 2001). This firm did not depend on an outsourcing strategy by which it would acquire new technologies from other firms or from an alliance, except for a few low-end products. Therefore, the management of R&D activities is the main source of new product development. If needs for new products or for improvement of old products are identified, projects which meet such needs are formed, including selecting a project manager.

I used interviews to understand the way exploration and exploitation are executed and assigned,

the way project managers are evaluated at the operational level, and characteristics of the 11 departments in this R&D center. I conducted 3 semi-structured interviews with managers who have been working on allocating projects to project managers. The managers who I interviewed have in-depth knowledge of and experience with the overall project process from initiation and selection to implementation. Each interview took about 90 minutes. I used a semi-structured protocol that included the project implementation process, characteristics of the departments, the process of project assignments and evaluation of projects and project managers.

The mobile phone R&D center has 11 departments. According to the interviews, these 11 departments are categorized into two groups: research and development. The research group mainly develops concepts for new technology and makes decisions on whether the development group will continue projects initiated by the research group. About 60% of the projects initiated in the research group are dropped. If a decision is made to continue a project, engineers in the development group develop a sample and send it to the production line.

In addition to the two groups, this R&D center has a group which assigns projects to project managers. This group has a matrix of all project members and project managers, which displays their skills, knowledge, and experience on projects. The project members are usually assigned to departments where their skills and knowledge match the requirements of the department[3]. The project managers are also assigned to a department based on a similar logic. The degree of alignment between individual skills and knowledge and those required by the department is greater for the project members. The assignment of projects to the project members and managers is less demanding than to departments. Managers who assign projects try to match the characteristics of projects with the skills, knowledge, and experience of the project members and managers. However, projects are assigned almost randomly to the project

[3] The initial assignment of the project members to departments was done based on their education level. According to my interview with a human resource manager, he tried to give priority to matching skills and knowledge of project members who had earned a masters degree or a Ph.D. degree with those needed by the departments. Project members who hold a bachelors degree were given second priority in the assignment of project members to the departments.

members and managers based on their time availability without considering the project type (exploration or exploitation). The degree of random assignment is also greater for the project managers because management skills are more important for them than technological knowledge and experience.

The risks associated with various project types may be recognized by the project managers. However, the risks of projects in the research stage and the development stage are recognized differently. As mentioned above, in the research stage, projects were dropped at a rate of about 60%. According to interviews, exploration projects are more likely to be dropped. This implies that the project managers knew that the risks of exploration projects were higher than those of exploitation projects. In the research stage, the managers who had been given exploration projects repeatedly would intentionally be assigned exploitation projects to boost their confidence. On the other hand, exploration projects in the development stage will end up launching new products or revised products. Therefore, the risks of exploration projects are not higher than those of exploitation projects. In sum, the project managers know that exploration is more risky than exploitation and the risks of exploration drop dramatically with the transition from the research stage to the development stage.

The Central R&D Center

The two central R&D centers deal with highly exploratory technologies which are related to the firm's four primary business areas. The business units assign the development of highly exploratory technologies to the two central R&D centers, while supporting this development by providing resources. The interviews revealed that this kind of exploration technology is defined as technology which the R&D centers of the four business units do not have the experience or capability to handle. Thus, the levels of difficulty and the duration of projects in the central R&D centers are usually higher and longer than those in the R&D centers of the four business units. Put differently, the level of exploration in projects is higher.

In the central R&D center where I collected data, project managers manage only one project per year (only 5 out of 244 managers managed two projects in one year between 2009 and 2012). There are

two ways to assign a project to a project manager. When a business unit requests a project, the project managers who are available at that time can apply. After that, a project assignment manager and a direct supervisor decide who will lead the project. In addition, the project managers may suggest a project which they think is important and can be used for the four business units. If any business unit accepts that project, the project managers can start the project which they suggested. Projects are categorized as exploration and exploitation, with exploration defined as a project in the research stage and exploitation as a project in the development stage. This implies that the categorization of exploration and exploitation is done only by the knowledge creation process, not by the content of the knowledge. This is because this R&D center is involved in only high-level exploration technologies.

4.2 – Samples and Data Collection

The research design, using the data collected from the two R&D centers, has three advantages. First, two R&D centers have variation in types of projects. The proportion of exploration projects in the central R&D center is higher than that in the mobile phone R&D center. The central R&D center focuses on more exploratory technology or products compared with the mobile phone R&D center. This implies that data analysis from the two R&D centers helps increase the generalizability of this study. Second, this study uses longitudinal data. The use of longitudinal data overcomes the weakness of cross-sectional studies which can not reveal the causality. The previous studies on ambidexterity at the individual level depended on either cross-sectional data or case studies. These research designs do not reveal the causality. Third, this study uses archival data. The archival data consists of objective (e.g., the number of projects) and subjective data (e.g., individual performance). The subjective data were collected from multi-sources. Thus, the research design using archival data removes a common method bias.

Two types of data were collected from the two R&D centers. The first type is an individual's level data, which includes an employee's demographic data (e.g., age, tenure, education, and department) and performance data. The second type of data is project level data, which includes the project type

(exploration and exploitation) and performance data (limited to the central R&D center). The description of these two types of data will be separately provided by the two R&D centers.

The Mobile Phone R&D Center

Two types of data were obtained from this R&D center. One is individual data, which contains individual information: department, tenure, education, age, and performance evaluations (2008 to 2011). The other data includes project information: project identification name, start date, end date, and project type. The two data sets need to be merged to analyze the relationship between managers' experience in project management and these managers' individual performance. After the two data were merged, 296 manager-year observations were identified and time-varying variables (i.e., age, tenure in this firm, and tenure in the current position) were adjusted. In the merged data, 122 managers directed 324 projects between 2008 and 2011 in the mobile phone R&D center (2.5 projects per manager).

4.2.1 Individual Data

The average tenure of the 122 managers in this firm was about 10 years in 2008 and the average age was 38 years old. The average tenure in the current position was about 4 years. In terms of their position, managers are classified as senior managers or managers. Senior managers made up 41% (50) and managers accounted for 59% (72) of the total in 2008. Seventy one (58%) managers of the 122 have a master's degree, 48 (39%) managers have a bachelor's degree, and 3 (2%) hold a Ph.D. degree. Not all managers were observed for four years: 21 managers were observed for four years, 38 managers for 3 years, 35 managers for 2 years, and 28 managers for 1 year. The reasons all managers were not observed for four years are that some managers were dispatched for training and some worked on the maintenance of project(s) that they had previously initiated.

Individual performance

With regard to the performance evaluations of managers, managers were evaluated as A, B, or C;

A represents the highest performance evaluation and C represents the lowest. The average individual performance evaluation for four years is constant: 2008 – 2.52, 2009 – 2.59, 2010 – 2.53 and 2011 – 2.57 (Table 4.1). I tested the difference of means in the individual performance evaluations for four years using ANOVA. The results suggest that there is no difference among the means in the individual performance evaluations for four years (F=0.28, p=0.84). A few managers got C (2%) for four years. Over half of the managers (57%) got A and 41% of the managers got B (Table 4.2).

Table 1: Individual Performance Descriptive Statistics in the Mobile Phone R&D Center

Year	Obs	Mean	Std. Dev.	Min	Max
2008	75	2.520	0.529	1	3
2009	80	2.588	0.520	1	3
2010	85	2.529	0.525	1	3
2011	54	2.574	0.602	1	3
4 years	294	2.551	0.538	1	3

Table 2: Individual Performance Descriptive Statistics in the Mobile Phone R&D Center (frequency)

Individual performance		Freq.	Percent	Cum.
2008	A	1	1.33	1.33
	B	34	45.33	46.67
	C	40	53.33	100
	Total	75	100	
2009	A	1	1.25	1.25
	B	31	38.75	40
	C	48	60	100
	Total	80	100	
2010	A	1	1.18	1.18
	B	38	44.71	45.88
	C	46	54.12	100
	Total	85	100	
2011	A	3	5.56	5.56
	B	17	31.48	37.04
	C	34	62.96	100
	Total	54	100	
4 years	1	6	2.04	2.04
	2	120	40.82	42.86
	3	168	57.14	100
	Total	294	100	

Individual competency

This firm has been conducting competency assessments with the goal of sharing the values and mission of this firm and giving feedback to enhance managers' competency. All managers in this R&D center are targets of this competency assessment. This firm adopted a 360° degree competency evaluation: current supervisor (1), colleagues who communicate with the ratee frequently (3-4), and subordinates who work with the ratee for at least three months (5-10). The number(s) in the parentheses represent the number of people who evaluate a manager. In addition, this firm has clear criteria to select the raters. A rater who is a supervisor needs to be an immediate one. If a ratee has more than two immediate supervisors, the rater who worked longer with the ratee was chosen. Raters who are colleagues of the ratee need to have frequent communication with the ratee and a similar position. Raters who are subordinates should have worked with the ratee for at least three months, preferably in the same department.

The competency assessment aims to evaluate three broad competencies: customer-related competency, people-related competency, and ethics-related competency. Customer-related competency consists of 8 items. Raters in the different levels used different numbers of items because all items are not applicable to all levels. Customer-related competency is associated with competency that enhances organizational performance and delivers value to customers. Among the 8 items, two items (e.g., Dream/Vision and Insight) were evaluated by raters in all three levels (Table 4.3). All items were measured in a one-to-seven scale.

Table 3: Items for Customer-related Competency

No	Competence	Questionnaire items	Subordinate	Supervisor	Colleague
1	Commitment to Improvement	Challenges the status quo and develops organization, self and others.	V	V	
2	Decisiveness	Makes quick and accurate judgments on ideas and suggestions of staff and other decision-making matters	V		
3	Desire to Lead	Proactively seeks to identify changes in business to take the initiative in new areas.	V		
4	Determination	Has strong determination and persistence when faced with challenging goals.	V		
5	Dream/Vision	Shares vision and goals that arouse passion in members	V	V	V
6	Emphasis on Customer	Always thinks and acts from a customer point of view	V		
7	Insight	Has insights into core of issues in complex situations and pinpoints opportunities	V	V	V
8	Readiness for the future	While pursuing short-term goals, steadily lays the groundwork for long-term goals	V	V	

People-related competency, which consists of 9 items, is related to competency that provides a favorable environment for members to work effectively and efficiently. Among the 9 items, two items (e.g., Respect for people and Teamwork/Cooperation) were evaluated by raters in all three levels (Table 4.4).

Table 4: Items for People-related Competency

No	Competence	Questionnaire items	Subordinate	Supervisor	Colleague
1	Communication 1	Creates a working environment where members can openly express their opinions	V		V
2	Communication 2	Clearly effectively communicates thoughts and ideas to members	V		
3	Creativity/Self-Discipline	Encourages members to perform their work with creativity and initiative in alignment with agreed-on vision and goals.	V	V	
4	Emphasis on Performance 1	Evaluates and rewards individuals fairly based on performance, abilities	V		
5	Emphasis on Performance 2	Pays close attention to quality and process of achievement as well as to its outcome	V		
6	Respect for Diversity	Does not force others to follow his/her thoughts/style but respects their diversity	V	V	
7	Respect for People	Treats individual members with respect in every situation.	V	V	V
8	Talent Development	Encourages members and provides them with opportunities to fully develop and realize their potential.	V	V	
9	Teamwork/ Cooperation	While serving the interests of his/her own department, tries hard to help others for the success of the whole company.	V	V	V

Ethics-related competency, which consists of 6 items, represents ethical behavior. Among the 6 items, one item (Honest reporting) was evaluated by raters in all three levels (Table 4.5).

Table 5: Items for Ethics-related Competency

No	Competence	Questionnaire items	Subordinate	Supervisor	Colleague
1	Dedication	Prioritizes success of members and organization above personal interests.	V		
2	Emphasis on principles	Respects the principles and rules of the company and executes them in a diligent manner	V		
3	Fair Competition	Does not resort to unfair/unethical means but fairly competes with rivals	V		
4	Fair Treatment	Provides all business partners with equal opportunities and treats them fairly.	V		
5	Honest Reporting	Reports honestly on work status or performance without belittling or exaggerating these.	V	V	V
6	Resolute Action	Takes decisive action against misconduct that violates rules/principles of company.	V		

In addition to the three competencies, two items were evaluated by raters at all three levels: virtuous leader versus charismatic leader (lead a team with charismatic authority) and risk taking versus risk management (be ready to take risks to achieve a goal). In sum, 25 items were developed for this competency assessment: 23 out of 25 are for subordinates, 13 out of 25 are for supervisors, and 7 out of 25 are for colleagues. 7 of the 25 that are for colleague are common items that can be compared. (Appendix A: Results of factor analysis of competency items) To aggregate all items for the competency assessment, I used the weighted average because the number of raters in the three levels is different.

Managers' competency was measured two times in 2009 and 2010. The number of managers who have competency data is less than those who have individual performance evaluation data. The average managers' competency was 5.97 (s.d. = 0.42). There is a significant difference between the

means in 2009 and 2010 (F=7.26, p=0.01) (Table 4.6). The average managers' competency decreased from 6.08 (2009) to 5.88 (2010).

Table 6: Individual Competency Descriptive Statistics in the Mobile Phone R&D Center (frequency)

Year	Obs	Mean	Std. Dev.	Min	Max
2009	53	6.082	0.332	4.855	6.640
2010	61	5.876	0.464	4.576	6.809
2 years	114	5.972	0.419	4.576	6.809

4.2.2 Project Data

In the mobile phone R&D center, the project managers are evaluated based on the performance of projects that they managed. Projects were classified into three categories by an expert in the mobile phone R&D center: A, B, and S. An S-type project represents one that develops products based on new technologies in this industry. An A-type project represents one that develops products based on new technologies to this firm. When a project makes products based on technologies which this firm already has, this project belongs to the B type. Thus, S and A-type projects are classified as exploration projects and B-type projects are defined as exploitation projects.

Between 2008 and 2011, 309 projects were executed in the mobile phone R&D center. S-type projects account for 6.47% (20 projects), A-type projects account for 17.15% (53 projects), and B-type projects account for 76.38% (236 projects) (Table 4.7). The average length of all projects is 234 days (minimum 13 days, maximum 601 days). Table 4.8 shows the total number of projects and the number of each type of project per year. The total number of projects in 2011 is less than half of that in 2008, 2009, and 2010 because projects that were not finished in 2011 were not counted. Overall, the proportion of exploration (projects S-type and A-type) is 24% out of 309 projects.

Table 7: The Distribution of S-, A-, and B-type Projects for 4 Years in the Mobile Phone R&D Center

	Freq.	Percent	Cum.
A	53	17.15	17.15
B	236	76.38	93.53
S	20	6.47	100
Total	309*	100	

* 142 projects out of 309 projects were conducted for two fiscal years

Table 8: The Distribution of S-, A-, and B-type Projects by Year in the Mobile Phone R&D Center

year	Total number of projects	The number of S-type projects		The number of A-type projects		The number of B- type projects	
2008	133	6	5%	28	21%	99	74%
2009	137	8	6%	23	17%	106	77%
2010	120	12	10%	12	10%	96	80%
2011	61	8	13%	8	13%	45	74%
4 years	451	34	8%	71	16%	346	77%

* The total number of projects in this table is bigger than the number of projects conducted in the mobile phone R&D center because a project which was conducted for two fiscal years was counted two times.

4.2.3 Three Types of Work Assignments

I categorized work assignments as three types in chapter 2: 1) ambidextrous work assignments 2) exploration work assignments and 3) exploitation work assignments. I proposed that ambidextrous work assignments were operationalized in two ways: concurrent execution and temporal separation. Based on the definition of concurrent execution, a manager is coded as having ambidextrous work assignments if both exploration and exploitation projects were assigned to that project manager in a certain year. If either an exploration or exploitation project(s) was assigned, a manager was coded as having exploration or exploitation work assignments.

Second, ambidextrous work assignments by temporal separation were measured in the following way. If exploration project(s) in a certain year were assigned and exploitation project(s) in the following year or vice versa, this manager is coded as having ambidextrous work assignments. If only exploration

project(s) were assigned to a project manager for two consecutive years, this manager is coded as having exploration work assignments. Lastly, if exploitation project(s) were assigned for two consecutive years, this manager is coded as having exploitation work assignments.

In terms of concurrent execution, ambidextrous work assignments account for 22%, exploration work assignments 15%, and exploitation work assignments 63% out of 296 manager-year observations for four years (Table 4.9). In terms of temporal separation, the proportion of ambidextrous work assignments was 25% out of 222 manager-year observations. This percentage is higher than that for concurrent execution. Exploration work assignments account for 15% and exploitation work assignments account for 63%.

Table 9: The Distribution of the Three Types of Work Assignments by Concurrent Execution in the Mobile Phone R&D Center

	Ambidextrous work assignments	Percent	Exploration work assignments	Percent	Exploitation work assignments	Percent	total
4 years	65	22%	45	15%	186	63%	296
2008	17	23%	12	16%	46	61%	75
2009	21	26%	12	15%	48	59%	81
2010	17	20%	11	13%	57	67%	85
2011	10	18%	10	18%	35	64%	55

Table 10: The Distribution of the Three Types of Work Assignments by Temporal Separation in the Mobile Phone R&D Center

	Ambidextrous work assignments	Percent	Exploration work assignments	Percent	Exploitation work assignments	Percent	total
3 years	56	25%	137	62%	29	13%	222
2009	24	30%	47	58%	10	12%	81
2010	21	25%	55	65%	10	12%	86
2011	11	20%	35	64%	9	16%	55

To rule out the possibility that managers who had high performance in a previous year may have more exploration projects than exploitation ones, the number of exploration projects was regressed against managers' performance in the previous year. The results show that there is no significant relationship between the number of exploration projects and the managers' performance in the previous year (F=.97, p=0.33). In addition, changes in work assignments were analyzed. Among the 122 managers, 69 were identified as having only exploration work assignments, 19 were identified as having only exploitation work assignments, and 7 were identified as having both exploration and exploitation work assignments. Among the 27 managers who had ambidextrous work assignments, only 3 were identified as having ambidextrous work assignments all the time. Ten managers had ambidextrous work assignments after having either exploration or exploitation work assignments and 14 managers had exploration and exploitation work assignments after having ambidextrous work assignments.

4.2.4 Differences between Senior Managers and Managers in the Mobile Phone R&D Center

Twenty (7%) out of the 122 were promoted from manager to senior manager between 2008 and 2011. The position of 200 manager-year observations was manager and that of 96 manager-year observations was senior manager. The average individual performance of the 200 managers was 2.64 (s.d. = 0.53) and that of the 96 senior managers was 2.38 (s.d. = 0.43). The average individual performance of managers and senior managers was significantly different (F=16.06, p=0.00). The average individual competency of the 200 managers was 5.99 (s.d. = 0.43) and that of the 96 senior managers was 5.94 (s.d. = 0.43). There is no difference in the individual competency of managers and senior managers.

In terms of work assignments, the senior managers who had ambidextrous work assignments accounted for 30% (29), those who had exploration work assignments 11% (11), and those who had exploitation work assignments 58% (56) out of the 96 senior managers. Of the 200 managers, the managers who had ambidextrous work assignments account for 18% (36), those who had exploration work assignments 17% (34), and those who had exploitation work assignments 65% (130). While the proportion of senior managers who had ambidextrous work assignments is larger than that of managers,

the proportion of managers who had either exploration or exploitation work assignments is larger than that of senior managers. More projects (1.82 projects per manager) were assigned to senior managers than managers (1.38 projects per manager). The percentages of project types S, A, and B are very similar for managers and senior managers (Table 4.11).

Table 11: The Distribution of S-, A-, and B-type Projects by Position in the Mobile Phone R&D Center

	S Projects	A Projects	B Projects	Total projects	# of managers	average
Senior managers	10	27	138	175	96	1.82
Percent	6%	15%	79%			
Managers	24	44	208	276	200	1.38
Percent	9%	16%	75%			
Total	34	71	346	451	296	1.52
Percent	8%	16%	77%			

4.2.5 Department Level

There are 12 departments: IA100A, IA100B, IA102A, IA130A, IK104A, IK106A, IK107A, IK108A, IK110A, IK111A, and IK112A (IK107A and IK108A are the development group and the others are the research group). Eighty-one percent of projects in the mobile phone R&D center were conducted in the development departments. These two departments account for between 77% (2009) and 89% (2011). In terms of the proportion of exploration (project S and A) out of all projects, the range in the research department is large due to the small number of projects (0% – 100%). In the development departments, the proportion of exploration in the IK107A department (30%) is higher than that in the IK108A department (11%), even though the two departments are categorized as development departments (Table 4.12). In the analysis, a dummy variable was created to control the different characteristics of the two types of departments.

Table 12: The Distribution of S-, A-, and B-type Projects by Department in the Mobile Phone R&D Center

year	department	Number of B project	Number of A project	Number of S project	Number of project S and A	Number of projects
2008	IA100B	2	0	0	0	2
	IA102A	2	3	0	3	5
	IA130A	2	0	0	0	2
	IK106A	2	1	1	2	4
	IK107A*	48	15	4	19	67
	IK108A*	34	7	1	8	42
	IK110A	6	2	0	2	8
	IK111A	2	0	0	0	2
	IK112A	1	0	0	0	1
	Total	99	28	6	34	133
2009	IA100B	3	0	0	0	3
	IA102A	7	1	0	1	8
	IA130A	1	0	0	0	1
	IK106A	3	2	1	3	6
	IK107A	48	12	6	18	66
	IK108A	33	5	1	6	39
	IK110A	7	3	0	3	10
	IK111A	2	0	0	0	2
	IK112A	2	0	0	0	2
	Total	106	23	8	31	137
2010	IA100A	0	1	0	1	1
	IA102A	9	0	1	1	10
	IA130A	0	1	0	1	1
	IK104A	1	0	0	0	1
	IK106A	2	1	0	1	3
	IK107A	46	7	9	16	62
	IK108A	33	2	1	3	36
	IK110A	4	0	1	1	5
	IK111A	1	0	0	0	1
	Total	96	12	12	24	120
2011	IA100A	0	1	0	1	1
	IA102A	3	1	0	1	4
	IK106A	1	0	0	0	1
	IK107A	21	6	7	13	34
	IK108A	20	0	0	0	20
	IK110A	0	0	1	1	1
	Total	45	8	8	16	61
	Grand TT	346	71	34	105	451

* Research department

The central R&D center

4.2.6 Individual Data

The following descriptive statistics are for all managers regardless of observation years. The average tenure of the 244 managers in this firm was about 12 years in 2009 and the average age was 42 years old in 2009. In terms of their position, senior managers made up 41% (101) and managers accounted for 59% (143) of the total in 2009. One hundred fifty-five (63%) managers of the 244 have a master's degree, 16 (7%) managers have a bachelor's degree, and 73 (30%) hold a Ph.D. degree. The portion of managers who hold a Ph.D. degree in the central R&D center is much higher than that in the mobile phone R&D center.

The following descriptive statistics are for the 113 managers who were observed for four years. The average tenure of these managers was about 9 years in 2009 and the average age was 38 years old in 2009. Senior managers made up 29% (33) and managers accounted for 71% (80) of 113 managers in 2009. The portion of managers is relatively higher than that in the mobile phone R&D center. Eighty-two (73%) managers of the 122 have a master's degree, 6 (5%) managers have a bachelor's degree, and 25 (22%) hold a Ph.D. degree.

Individual performance

Performance evaluation was conducted in the same way as in the mobile phone R&D center. Table 4.13 shows the basic statistics of individual performance. The average individual performance evaluation during four years is constant: 2009 – 2.71, 2010 – 2.61, 2011 – 2.57 and 2012 – 2.66 (Table 4.14). I tested the difference of means in the managers' performance evaluation for four years using ANOVA. The results suggest that there is no difference among the means in the individual performance evaluations for four years (F=1.53, p=0.2)

Table 13: Individual Performance Descriptive Statistics in the Central R&D Center

Performance	Obs	Mean	Std. Dev.	Min	Max
4 years	452	2.635	0.522	1	3
2009	113	2.708	0.476	1	3
2010	113	2.611	0.490	2	3
2011	113	2.566	0.596	1	3
2013	113	2.655	0.514	1	3

Table 14: Individual Performance Descriptive Statistics in the Central R&D Center (frequency)

		Freq.	Percent	Cum.
4 years	1	9	1.99	1.99
	2	147	32.52	34.51
	3	296	65.49	100
	Total	452	100	
2009	1	1	0.88	0.88
	2	31	27.43	28.32
	3	81	71.68	100
	Total	113	100	
2010	2	44	38.94	38.94
	3	69	61.06	100
	Total	113	100	
2011	1	6	5.31	5.31
	2	37	32.74	38.05
	3	70	61.95	100
	Total	113	100	
2012	1	2	1.77	1.77
	2	35	30.97	32.74
	3	76	67.26	100
	Total	113	100	

Project performance

The evaluations of projects were made based on the accomplishment of project milestones. When a project starts, the project manager is required to submit the milestones of the project. At the end of the year, a direct supervisor evaluates the project. This central R&D center is not directly related to product development and commercialization, thus, the sales of final product(s) are not considered in the project evaluations. Exploration and exploitation projects were evaluated separately. The relative evaluations of exploration and exploitation projects were made every year. Projects were evaluated using a 5-point scale in which five represents the highest performance and one means the lowest. The project managers were evaluated based on other key performance indexes such as the development of project members and activities for innovation as well as on the performance of project(s). Project performance evaluations were done using a 5-point scale (1, lowest – 5, highest). There is no difference among the means of project performance evaluations for four years (F=0.51, p=0.67)

Table 15: Project Performance Descriptive Statistics in the Central R&D Center

project performance	Obs	Mean	Std. Dev.	Min	Max
4 years	441	3.374	0.950	1	5
2009	103	3.301	0.958	1	5
2010	112	3.411	0.973	1	5
2011	113	3.442	0.925	1	5
2013	113	3.336	0.951	1	5

* 10 in 2009 were missing and 1 in 2010 was missing

Table 16: Project Performance Descriptive Statistics in the Central R&D Center (frequency)

4 years	Freq.	Percent	Cum.
1	11	2.49	2.49
2	53	12.02	14.51
3	198	44.9	59.41
4	118	26.76	86.17
5	61	13.83	100
Total	441	100	

2009	Freq.	Percent	Cum.	**2010**	Freq.	Percent	Cum.
1	3	2.91	2.91	1	2	1.79	1.79
2	14	13.59	16.5	2	15	13.39	15.18
3	48	46.6	63.11	3	48	42.86	58.04
4	25	24.27	87.38	4	29	25.89	83.93
5	13	12.62	100	5	18	16.07	100
2011	Freq.	Percent	Cum.	**2012**	Freq.	Percent	Cum.
Total	103	100		Total	112	100	
1	2	1.77	1.77	1	4	3.54	3.54
2	11	9.73	11.5	2	13	11.5	15.04
3	52	46.02	57.52	3	50	44.25	59.29
4	31	27.43	84.96	4	33	29.2	88.5
5	17	15.04	100	5	13	11.5	100
Total	113	100		Total	113	100	

Individual competency

Managers' competency was evaluated every year using the same items as in the mobile phone R&D center. The average managers' competency for four years was 6 (s.d. = 0.35) (Table 4.17). There is a significant difference among the means of managers' competency for four years (F=3.14, p=0.025).

Table 17: Individual Competency Descriptive Statistics in the Central R&D Center

Competency	Obs	Mean	Std. Dev.	Min	Max
4 years	342	6.007	0.352	4.958	6.800
2009	61	5.901	0.299	5.196	6.483
2010	79	5.999	0.345	5.100	6.800
2011	89	6.006	0.391	4.958	6.664
2013	113	6.071	0.341	5.021	6.772

4.2.7 Project Data

In this R&D center, managers were assigned to either exploration or exploitation at any given time. The managers were evaluated based on the main project that they managed in a focal year. This R&D center classified a project as either exploration or exploitation using the knowledge creation process. If a project is in the research stage, this project is classified as exploration. If a project is in the development stage, it is classified as exploitation. For 4 years, exploitation projects accounted for 64% out of all projects and exploration projects consisted of 36%. The proportion of exploration projects was higher in the central R&D center than in the mobile phone R&D center (about 24%). Table 4.18 shows the distribution of exploration and exploitation projects by year.

Table 18: The Distribution of Project Type (Exploration and Exploitation) in the Central R&D Center

4 years	Project type	Freq.	Percent	Cum.
	Exploitation	447	63.68	63.68
	exploration	255	36.32	100.00
	Total	702	100.00	

2009		Freq.	Percent	Cum.
	exploitation	116	65.17	65.17
	exploration	62	34.83	100.00
	Total	178	100.00	

2010		Freq.	Percent	Cum.
	exploitation	86	58.50	58.50
	exploration	61	41.50	100.00
	Total	147	100.00	

2011		Freq.	Percent	Cum.
	exploitation	72	52.94	52.94
	exploration	64	47.06	100.00
	Total	136	100.00	

2012		Freq.	Percent	Cum.
	exploitation	173	71.78	71.78
	exploration	68	28.22	100.00
	Total	241	100.00	

4.2.8 Three Types of Work Assignments

Considering the way a project was assigned and the classification of exploration and exploitation projects, the assignment of ambidextrous work needs to be operationalized using temporal separation. The assignment of ambidextrous work accounts for 29% (97) out of 339 manager-year observations for four years (Table 4.18). The portion of ambidextrous work assignments ranges from 24% to 35% by year. The assignment of exploration work accounts for 23% (79) and that of exploitation work accounts for 48% (163).

Table 19: The Distribution of the Three Types of Work Assignments in the Central R&D Center

	Ambidextrous work assignments	Percent	Exploration work assignments	Percent	Exploitation work assignments	Percent	total
4 years	97	29%	79	23%	163	48%	339
2009 - 10	27	24%	25	22%	61	54%	113
2010 - 11	32	28%	29	26%	52	46%	113
2011 - 12	39	35%	25	22%	49	43%	113

To rule out the possibility that ambidextrous work in a certain year was assigned to a manager who had earned a high performance evaluation in the previous year, the assignment of ambidextrous work was regressed against managers' performance in the previous year. The result shows that there is no significant relationship between the assignment of ambidextrous work and managers' performance in the previous year.

4.2.9 Differences between Senior Managers and Managers in the Central R&D Center

The position of the 99 manager-year observations was senior manager and that of the 240 manager-year observations was manager. The average individual performance of the 99 senior managers was 2.76 (s.d. = 0.48) and that of the 240 managers was 2.55 (s.d. = 0.55). The average project performance of the 99 senior managers was 3.44 (s.d. = 1.1) and that of the 240 managers was 3.36 (s.d. = 0.91). The average individual competency of the 73 senior managers was 6.2 (s.d. = 0.4) and that of the 208 managers was 6 (s.d. = 0.33)[4]. There is a significant difference between senior managers and managers in terms of individual performance (F=10.88, p=0.00) and individual competency (F=16.81, p=0.00). However, there is no difference in terms of project performance.

Regarding work assignments, senior managers were found to manage more risky and more difficult work. The senior managers who were assigned ambidextrous work account for 41% (41), those

[4] Not all managers have had a competency evaluation. Thus, the number of senior managers and managers with a competency evaluation is smaller than number of senior managers with evaluation of individual performance and project performance

who were assigned exploration work account for 28% (28), and those who were assigned exploitation work account from 30% (30) out of the 99 senior managers. The managers who were assigned ambidextrous work account for 23% (56), those who were assigned exploration work account for 21% (51), and those who were assigned exploitation work account from 55% (133) out of the 240 managers (Table 4.20). While the proportion of ambidextrous work and exploration work in the senior managers' work assignments is larger than that in the managers' work assignments, the proportion of exploitation work in the managers' work assignments is much larger than that in the senior managers' work assignments.

Table 20: The Distribution of the Three Types of Work Assignments by Position in the Central R&D Center

Position	Ambidextrous work assignments		Exploration work assignments		Exploitation work assignments		Total
Senior manager	41	41.41	28	28.28	30	30.3	99
Manager	56	23.33	51	21.25	133	55.42	240

As the above description reveals, the research site allows for the study of managers and projects in two different R&D labs with rich archival data observed over multiple years. The setting is ideal for studying different operationalizations of ambidexterity and addressing the research questions of interest.

CHAPTER 5

HYPOTHESES DEVELOPMENT

Exploration and exploitation become tasks which middle managers and non-managerial individuals need to perform after top managers make a strategic decision to pursue appropriate levels of exploration and exploitation to achieve organizational ambidexterity. At the operational level, a firm decides how to allocate exploration and exploitation tasks to individuals. This leads to the first research question: Should people specialize in one type or the other or should they work on both?

If a firm strategically assigns different types of work to individuals, we need to investigate what types of work assignments lead to better individual performance or better project performance. Previous research demonstrates individuals needed to manage a number of challenges to take on exploration and exploitation tasks (Raisch et al., 2009). For example, successful ambidextrous individuals must handle contradictions and tensions (Smith & Tushman, 2005) and hold paradoxical thinking (Gibson & Birkinshaw, 2004). Ambidextrous work is defined as certain tasks which are hard for individuals to manage, but contribute to achieving organizational ambidexterity. However, little research has been done to investigate the relationship between the assignments of ambidextrous work to individuals and their performance. By comparing the effect of different types of work assignments on individual performance, we can understand the relationship between work assignments and individual performance. This leads to the second research question: What are the consequences of different types of work assignments?

It is important to answer the two research questions above to understand how exploration and exploitation are implemented at the operational level and antecedents or consequences of work assignments. These questions are also related to finding the best way to assign different types of work to individuals to create successful organizational ambidexterity. In order to answer these two research questions, I adopted a new approach for ambidexterity at the individual level, using work assignments.

5.1 – Antecedents of Different Types of Work Assignments

Exploration and exploitation have been studied in the literature of various fields such as organizational adaptation (Brown & Eisenhardt, 1997; Leana & Barry, 2000; Miller & Friesen, 1984; Probst & Raisch, 2005; Tushman & Romanelli, 1985; Volberda, 1996), strategic management (Burgelman, 1991; 2002), organizational design (Burns & Stalker, 1961), and technological innovation (Abernathy & Clark, 1985; Dewar & Dutton, 1986; Tushman & Anderson, 1986). Diverse conceptualizations originate from March's (1991) definitions of exploration and exploitation, which provide distinct characteristics of the two activities. Exploration activities aim at generating radical innovation by taking risks and experimentation, whereas exploitation activities pursue incremental innovation by focusing on refinement of current capabilities (March, 1991; Levinthal & March, 1993). These opposing characteristics of exploration and exploitation were described at the firm level. But the two activities can also be interpreted as the work assignments to individuals who implement them.

Previous research demonstrates that the core of exploration is generating variety in experience (Holmqvist, 2003). Individuals need to search for new approaches toward technologies and business processes to implement exploration (McGrath, 2001). Thus, exploration activities usually have high levels of riskiness, ambiguity, and complexity. On the other hand, the core of exploitation is building reliability in experience (Holmqvist, 2003). Individuals apply and improve existing approaches toward technologies and business processes to execute exploitation. Thus, exploitation activities are easy to implement due to low levels of riskiness, ambiguity, and complexity compared with exploration activities (Raisch & Birkinshaw, 2008). In terms of the consequences of the two activities, the outcomes of exploration are uncertain, but are more influential for long-term organizational performance, whereas exploitation is associated with short-term performance (Levinthal & March, 1993).

Given the differences between exploration and exploitation in terms of difficulty and degree of impact on organizational performance, organizations may strategically assign exploration and exploitation to individuals to maximize their performance (Adler et al., 1996). Exploration activities require high

levels of skills and knowledge of technologies compared with exploitation activities (Hass, 2006). In addition, individuals' decision-making skills and ability to solve problems are particularly vital to the success of exploration activities because these activities do not have clear goals and directions (Lavie et al., 2010). Therefore, I suggest the following hypothesis:

H1: Exploration work is assigned to individuals who have higher levels of skills, knowledge, and capabilities compared with exploitation work.

When exploration work is assigned to individuals, exploration or exploitation work can be simultaneously assigned to them. Thus, two types of work assignments include exploration work: exploration and ambidextrous work assignments. Two literatures (i.e., ambidexterity and exploration & exploitation literature) address two competing hypotheses. In the ambidexterity literature, researchers have argued that it is challenging for individuals to excel both exploration and exploitation. This implies that organizations will assign ambidextrous work to individuals who have high levels of skills and knowledge. On the other hand, researchers in the exploration and exploitation literature have suggested that organization strategically assign exploration to individuals who have high levels of skills and knowledge. I will elaborate both arguments in the following section.

Previous research proposed that a number of challenges need to be overcome for individuals to handle exploration and exploitation simultaneously. Individuals must manage contradictions and conflicting goals between exploration and exploitation (Smith & Tushman, 2005) and hold paradoxical thinking (Gibson & Birkinshaw, 2004). Individuals also need to be engaged in multiple roles to implement the two (Floyd & Lane, 2000). Previous research illustrated that individuals must be involved in both reliability-enhancing and variety-increasing learning activities (Holmqvist 2003, McGrath 2001), acquire both explicit and tacit knowledge (Lubatkin et al. 2006), and engage in both local and distant pursuits of knowledge (Hansen et al. 2001). Cohen & Levinthal (2007) suggested that prior related

knowledge helps individuals to be ambidextrous. In sum, it is challenging for individuals to implement exploration and exploitation well (Gupta et al., 2006). Thus, organizations may assign ambidextrous work (both exploration and exploitation) to individuals who hold capabilities or abilities to excel at both activities. Therefore, I suggest the following hypothesis:

H2a: Ambidextrous work is assigned to individuals who have higher levels of skills, knowledge, and capabilities compared with exploration work.

Appropriate work assignments to individuals should be made in terms of the strategic importance of the work and the match between the work requirements and the skills and knowledge of individuals (Patanakul & Milosevic, 2009). In the exploration and exploitation literature, exploration has a greater impact on organizational performance and in turn has a higher level of strategic importance. Thus, organizations are likely to assign exploration to individuals who have higher levels of skills and knowledge because the successful completion of exploration work assignments is more critical to business success compared with that of exploitation work assignments (Alder et al., 1996). With limited resources (e.g., time and human resources) available for the execution of work assignments, organizations assign exploration work to individuals who have higher levels of skills, knowledge, and capabilities. Work assignments also are given to managers based on level of task complexity and technological novelty (Patanakul & Milosevic, 2009). The more challenging work assignments are in terms of risk, task complexity, and technological newness, the more likely to the work assignments are to be assigned to managers who with higher levels of skills , knowledge, and capabilities.

H2b: Exploration-only work is assigned to individuals who have higher levels of skills, knowledge, and capabilities compared with ambidextrous work.

5.2 – Individual Performance as the Outcome of Ambidextrous Work Assignments

The assignments of exploration, exploitation, or both (ambidextrous work) become tasks which individuals need to fulfill and can be interpreted as individuals' work experience. In order to understand the effect of work assignments, we need to understand how work experience influences individual outcomes. Thus, I will introduce work experience theory and delineate how work assignments result in different individual outcomes.

Work Experience Theory

Work experience influences the development of our knowledge, skills, attitude, and behaviors (Tesluck &Jacob, 1998). The term work experience in the industrial-organizational psychology literature has been used interchangeably with tenure and seniority (Hofmann et al., 1992). However, there are significant differences between work experience and tenure. Tenure is defined as the amount of time spent in an organization or in a job and thus does not account for differences among individuals in terms of what they have done (Tesluck &Jacob, 1998). Work experience contains the challenges and accomplishments which individuals acquire through the implementation of given tasks. Thus, work experience should be conceptualized using both quantitative and qualitative aspects of events which are associated with work performance (Tesluk & Jacob, 1998).

There are two ways to capture work experience. First, work experience has been measured using quantitative terms. Many studies have measured work experience using tenure (McDaniel, Schmidt, & Hunter, 1988) or the number of times an individual has performed a certain task (Lance, Hedge, & Alley, 1989; Vance, Coovert, MacCallum, & Hedge, 1989). This approach focused on amount and time (Tesluk & Jacob, 1998). Second, work experience can also be measured using qualitative terms such as the level of challenge and complexity (Ford et al., 1992) and contextual factors (i.e., performance management systems and feedback systems). Although quantitative measures have been widely used in the work experience literature, they do not provide enough information about the nature of work experience

(Tesluk & Jacob, 1998). Qualitative measures such as the variety and breadth of tasks and responsibilities in a job and the degree of challenge that workers face in their job represent the specific nature of work situations (Tesluk & Jacob, 1998).

The assignment of exploration and exploitation represents both quantitative and qualitative dimensions of work experience; the amount of exploration or exploitation activities is the quantitative dimension of work experience while the nature of the two activities represents the qualitative dimension because the two types of projects have different levels of challenges and breadth of tasks. If the quantitative dimension of work is similar among employees in an organization, the qualitative dimension provides important information on how work experience influences individual outcomes.

There is increasing recognition that work experience is a potent form of management development (Keys & Wolfe, 1988). Work experience accounts for 70% of all development experience (Wick, 1989). On-the-job training is most likely to occur when managers are faced with challenging job situations (Berlew & Hall, 1966; Davies & Easterby-Smith, 1984; Kelleher, Finestone, & Lowy, 1986; Wick, 1989). McCauley et al. (1994) called the features of challenging jobs development components. These challenging jobs create opportunities and motivation to learn. Opportunities to learn occur when managers face a novel or ambiguous situation which generates incompatible demands. In a similar way, managers are more likely to be motivated when they have challenging jobs.

McCauley et al. (1994) provided five characteristics of challenging jobs: job transition, task-related characteristics creating change, high level of responsibility, non-authority relationships, and obstacles. A job transition implies a change in job content, status, or location (Nicholson, 1984). Job transitions of managers that have been known to be developmental include a switch from line to staff (McCall et al., 1988), changes in employer, status, or function (Nicholson & West, 1988), and increase in the scope of responsibilities. Job transitions are developmental because managers in novel situations need to come up with new ways to cope with these situations and to prove themselves to their new peers,

subordinates and supervisors (Davies & Easterby-Smith, 1984; Louis, 1982; Nicholson & West, 1988; Wick, 1989).

Task-related characteristics of challenging jobs are related to problems originating from the tasks themselves. There are three types of task-related characteristics: those stemming from 1) creating change 2) high levels of responsibility and 3) non-authority relationships. Tasks related to the implementation of change generate both opportunities and motivation for learning (Dechant, 1990; McCall et al., 1988; Valerio, 1990). A higher level of responsibilities is positively associated with better learning situations (Kelleher et al., 1986; McCall et al., 1988). Lastly, situations in which managers have little formal authority over others are highly developmental (McCall et al., 1988). The last characteristic of developmental components is obstacles which managers face in their jobs. Learning opportunities which come from overcoming difficult situations and discomfort provide the motivation managers with learn (Field & Harris, 1991; McCall et al., 1988).

Three types of work assignments (exploration, exploitation, and ambidextrous work assignments) result in different work experience due to the opposing nature of exploration and exploitation activities. Characteristics of exploration and exploitation activities have been studied to suggest ways to manage the two types of activities effectively. Exploration and exploitation activities should be managed differently due to their different characteristics (Cardinal, 2001). The key characteristics of exploration and exploitation are compared in terms of riskiness, ambiguity, and non-routineness. Exploration activities tend to have higher levels of riskiness, ambiguity (in terms of the direction of activity), and non-routineness. On the other hand, exploitation activities are characterized as having lower levels of these three factors. In addition, individuals feel greater uncertainty regarding their responsibility and the nature of tasks when they work on exploration activities (Hass, 2006). This is due to the fact that exploration activities usually do not have a clear direction or boundary. These studies argued that characteristics of exploration activities negatively influence their success. This argument is consistent with that of March (1991) that the outcomes of exploration are remote and uncertain. Although the probability of success of

exploration activities is lower compared with that of exploitation activities, organizations pursue exploration to gain future viability (Lavie et al., 2010; Raisch & Birkinshaw, 2008).

These negative aspects exploration activities do not fully provide the implication of exploration on individual. Most studies in the exploration and exploitation literature have been concerned with organizational level outcomes rather than individual outcomes. From the viewpoint of organizations, exploration needs to be pursued for better performance and longer survival even though organizations are more likely to orient themselves towards exploitation. However, the assignment of exploration and exploitation activities may have different implications for individuals because individuals are concerned about learning opportunities and motivation (individual outcomes) to work as well as the success of exploration activities (organizational outcomes). I argue that the assignment of exploration and exploitation activities to individuals can be interpreted as work experience and that different work experience will lead to different individual outcomes.

In order to understand the implications of exploration and exploitation activities for individuals, we need to understand how the two types of activities generate different work experience. Developmental jobs feature challenging characteristics (McCauley et al., 1994). Among five characteristics, job transition and non-authority relationships are not related to characteristics of exploration and exploitation activities directly. I will compare the two types of activities using three characteristics of developmental jobs: creating change, high level of responsibility, and obstacles. Assignment of work which implements change generates both opportunities and motivation to learn (McCall et al., 1988). Usually, an assignment which deals with implementation of change has a clear goal, but does not define a clear role for person carrying out assignment (Davies & Easterby-Smith, 1984; Kelleher et al., 1986). This gives individuals the freedom to achieve the goal in their own way and encourages them to try new behaviors to cope with the ambiguity (Brett, 1984; Davies & Easterby-Smith, 1984; Kelleher et al., 1986). Thus, both exploration and exploitation activities belong to assignments related to the implementation of change.

Exploration activities are usually more unclear about the role and responsibilities of individuals

and in turn, individuals have more freedom determine how to accomplish the goal and to choose new behaviors. Therefore, the assignment of exploration activities will lead to high levels of opportunities and motivation to learn. Higher levels of responsibility are a key element of learning situations (Kelleher et al., 1986; McCall et al., 1988). Jobs with a high level of responsibility are characterized by high visibility and more significant impact on an organization (Stewart, 1984). Exploration activities aim at developing new technology (Abernathy & Clark, 1985; Dewar & Dutton, 1986; Tushman & Anderson, 1986), adapting to a new environment (Tushman & Romanelli, 1985) and increasing variation (Burgelman, 2002). Such characteristics make exploration activities more visible. In addition, the outcomes of exploration have a more significant impact than those of exploitation. Therefore, exploration activities provide higher levels of responsibility than exploitation activities. As the third component for challenging jobs, obstacles offer opportunities and motivation to learn. Individual learning comes from the effort to reduce discomfort associated with difficult situations (Field & Harris, 1991; McCall et al., 1988). Exploration activities are more likely to generate obstacles than exploitation activities because exploration activities do not provide a clear role for those who are assigned them and do not have a clear way to achieve goals.

The characteristics of exploration and exploitation may differ by the level of analysis. Exploration activities have high levels of riskiness, ambiguity, and uncertainty from the viewpoint of an organization, while their outcomes help organizations to gain future viability (March, 1991). This perspective has been prevalent in the exploration and exploitation literature. Despite these characteristics of exploration, organizations need to pursue exploration while pursuing exploitation to gain a competitive advantage in the future. However, the characteristics of exploration are perceived differently by individuals who execute exploration and exploitation activities at the operational level. Although exploration activities have high levels of riskiness and ambiguity, they also provide challenging work environments where individuals have opportunities and motivation to learn.

The Outcome of Work Assignments

The previous approaches in the ambidexterity literature assume that ambidextrous managers have knowledge, capabilities and abilities to handle both exploration and exploitation and to cope with the cognitive complexity which comes from engaging in the two activities. However, ambidextrous work assignments help managers develop such characteristics. I will elaborate the benefits and costs of ambidextrous work assignments compared with exploration or exploitation work assignments.

Ambidextrous work assignments are more likely to provide individuals with opportunities to develop capabilities compared with strictly exploration or exploitation work assignments. Individuals who are assigned exploration and exploitation work develop knowledge, skills, and behaviors required to execute either exploration or exploitation. Individuals with exploration work assignments become experts in developing new knowledge and directing people in exploration activities, whereas individuals who are assigned exploitation work become good at commercializing current knowledge effectively and managing people in exploitation activities. Thus, they become specialists in either exploration or exploitation. On the other hand, individuals who have ambidextrous work assignments are exposed to both exploration and exploitation. They need to develop knowledge and skills to execute the two activities. Therefore, they are more likely to develop a broader range of knowledge and skills whereas people assigned to only exploration or exploitation are more likely to develop specialized skills and knowledge.

Individuals with ambidextrous work assignments are provided with more challenging work environments than those with exploitation work assignments. Individuals with exploitation work assignments are prone to be demotivated because exploitation activities do not provide a challenging work environment. According to McCall et al. (1988), several factors shape challenging work environments: job transition, non-authority relationships, creating change, high level of responsibility, and obstacles. Three factors (i.e., creating change, high level of responsibility, and obstacles) are directly associated with different characteristics of exploration and exploitation activities. Activities related to the creation of change offer opportunities and motivation to learn (McCall et al., 1988). Although both

exploration and exploitation activities are associated with creation of change, exploration activities usually are more strongly associated with activities related to change. In terms of responsibility, exploration activities require a higher level compared with exploitation activities because exploration activities are more significant and more visible in organizations (Steward, 1984). Lastly, exploration activities usually contain more obstacles which provide opportunities to learn and be motivated (McCall et al., 1988). Therefore, individuals with ambidextrous work assignments are exposed to more challenging work environments and in turn are more likely to achieve higher individual performance than those with exploitation work assignments.

On the other hand, individuals with ambidextrous work assignments are provided with less complex and ambiguous environments compared with those with exploration work assignments because ambidextrous work assignments offer buffers for the high uncertainty or ambiguity that individuals with exploration work assignments face. Exploration activities offer challenging environments to learn and to be motivated. However, individuals with exploration work assignments are exposed to only uncertain and ambiguous environments. These uncertainty and ambiguity are characterized by complexity in tasks. Individuals experience complexity in tasks when tasks do not have clear instructions for goals (Campbell, 1988). Although exploration activities function as a positive factor in offering challenging a work environment, exceptionally high levels of complexity or ambiguity can negatively influence individuals' performance. Exploitation activities which individuals with ambidextrous work assignments perform can function as buffers for the high levels of complexity or ambiguity involved in exploration activities. Therefore, I suggest the following hypothesis:

H3: Ambidextrous work assignments (the assignment of both exploration and exploitation) are positively associated with individual performance compared with exploration or exploitation work assignments.

5.3 – Methods and Results

Measures

Antecedents of Different Types of Work Assignments

Dependent variables. The dependent variable for hypothesis 1 is any exploration work. Any exploration work is coded as 1 when exploration work is assigned to managers regardless of the assignment of exploitation. I created a dummy variable for hypotheses 2 and 3 to indicate if the work assignments are ambidextrous (1, yes; 0, exploration work assignments). Exploration work assignments mean that only exploration work was assigned to a manager. Ambidextrous work assignments imply that both exploration and exploitation work was assigned to a manager.

I adopted an objective measure (work assignment) to define the three types of work assignments. To decide the type of work assignments, a decision needs to be made about the time span within which the manager managed exploration, exploitation, or both. The time span is set as two years. In the central R&D center, only temporal separation is applicable because this R&D center assigns only one project at a time (usually for a year). In the mobile phone R&D center, a large portion of managers have one project per year (65%). In addition, the average period of all projects is 234 days (minimum 13 days, maximum 601 days). Thus, all managers experienced at least two projects within two years.

Independent variables. There are several indicators which show skills, knowledge, and capabilities of individuals. First, individuals with advanced education have a broad range of knowledge, have the capability to employ various problem-solving methods, and are more likely to generate diverse ideas for innovation (Damanpour & Schneider, 2006; Huber, Sutcliffe, Miller, & Glick, 1993; Lee, Wong, & Chong, 2005). Second, individual performance and competency are indicators to show individuals' skill, knowledge, and capabilities. Competencies are defined as a measure of individual traits, capabilities, and behaviors and should be aligned with the improvement of organizational performance (Hogan et al., 2006). These three variables which are possible indicators were set as independent variables.

Individual performance: Individual performance was created using 1 to 3 scales. This variable is lagged by one year.

Education 1 and 2: I created two education dummy variables. Education 1 dummy takes the value of one if a manager has a bachelor's degree. Education 2 dummy takes the value of one if a manager has a Ph.D. degree. A manager with a master's degree is the reference.

Individual competency: I created the variable individual competency measured as competency evaluation conducted in this firm. (See research setting and method chapter for details)

Control variables. (Data in the mobile phone R&D center)

Individual controls. *Types of work assignments:* Previous work assignments can influence subsequent work assignments. Individuals with different previous work experience may have different competencies and capabilities. To control for previous experience, I created dummy variables for work assignments: ambidextrous work assignments and exploration work assignments to set exploitation work assignment as a reference type. Both variables are lagged by one year.

Age: Age may influence the work assignment because old managers are expected to have better capabilities and more knowledge from their work experience. This variable is lagged by one year.

Tenure: I created the variable tenure measured as the number of years a manager has worked in the firm.

Position: To control for hierarchical level effects, I created the dummy variable position. Position takes the value of one if a manager is not a senior manager and the value of zero if otherwise. This variable is lagged by one year.

Department controls. *Department:* The eleven departments in the mobile phone R&D center have different functions in terms of the knowledge creation process (research and development stage). Two different stages influence the amount and difficulty of exploration and exploitation (Li et al., 2009). To control this effect, I created the dummy variable department. The department dummy variable takes the value of one if a department is development and the value of zero if it is a research department.

Exploitation and exploration (department): The amount of exploration and exploitation can influence work assignments within a department. Although the department dummy variable controls the effect of research and development departments, the amount of the two activities in departments directly influences the types of work assignments. To control this effect, I created the variables exploration and exploration in department. Both are measured as the number of projects in departments. Both are lagged by one year.

Control variables. (central R&D center): Department level controls were not applicable in this R&D center. The following control variables were created: Types of work assigned, individual competency, individual performance, age, and position. All variables are lagged by one year.

Estimation

Traditional least square regression techniques cannot be used because the dependent variable is dichotomy (hypothesis 1) or a categorical one (hypothesis 2 and 3). Instead, a *logit* is used for hypothesis 1 because the dependent variable takes dichotomy values. A multinomial *logit* model is used for hypotheses 2 and 3 because the dependent variable takes discrete but not ordered values. Exploitation work assignments were used as the base category. All independent variables are lagged by one year because previous characteristics influence later work assignments.

Individual Performance as the Outcome of Work Assignments

If variables were explained in the previous section, only the name of the variables will be displayed.

Short-term and long-term performance

Dependent variables. The dependent variable for investigating the effect of work assignment on individual outcomes is individual performance. The effect of work assignments on short-term performance was investigated using data in the central R&D center and the effect on long-term

performance was tested using data in the mobile phone R&D center. Short-term performance was evaluated through a yearly observation and long-term performance by a three-year observation.

Independent variables. Assignment of Ambidextrous work was created as an independent variable. The operationalization of ambidextrous work assignments in the previous section is applicable to data in the central R&D center because performance evaluations are done through one-year observation. The operationalization of ambidextrous work assignments in the mobile phone R&D center is similar.

Other operationalizations are used due to the three years observation of long-term performance. In the mobile phone R&D center, 59 managers were observed over 3 years (between 2008 and 2011). However, there are five combinations of observation years for these 59 managers. Table 5 shows the structure of data to test the hypothesis. In order to reconstruct the data, I decided to ignore the 2011 data of managers who were observed for four years to make the observation year of all 59 managers three. I made new variables 1) ambidextrous work assignments (period 1) – the first observation of assignment of ambidextrous work: the observation of 7 managers starting in 2009 and that of 52 managers starting in 2008. Thus, ambidextrous work assignment (period 1) was defined as work assignments in 2009 for 7 managers and in 2008 for 52 managers. 2) ambidextrous work assignments (period 2) – the second observation of assignment of ambidextrous work 3) competency (period 2): Not all managers had a competency evaluation in 2009 and 2010. If a manager was observed in 2008 and had a competency evaluation in 2009 and 2010, the competency (period 2) was the average of 2009 and 2010. The first two variables are independent variables.

In addition, I created two additional independent variables to capture assignment of ambidextrous work. First, I created concurrent ambidextrous work assignment. This variable takes the value of one when ambidextrous work was assigned in both periods and the value of zero if otherwise. Second, temporal ambidextrous work assignment was created to capture cycles of exploration and exploitation in both periods as well as concurrent assignment of ambidextrous work. This variable takes the value of one if exploration work in one period and exploitation work in another period were assigned

and ambidextrous work was assigned in both periods.

Table 21: Five types of the observation years for 59 managers

Period 1	Period 2	Period 3
IV: Ambidextrous work assignment (period 1)*	IV: Ambidextrous work assignment (period 2)	DV: Individual performance (long-term)
	Individual competency	
IV: Ambidextrous work assignment (period 1 and 2)		
IV: Ambidextrous work assignment (temporal)		

* 7 out of the 59 managers were observed from 2009 and the rest of them from 2008

Control variables (mobile phone R&D center). Individual performance, individual competency, age, tenure, education, position, and department.

Control variables (central R&D center). Individual performance, individual competency, age, tenure, education, and position

Estimation

To test hypothesis 2, two models were available. Ordered *logit* model is the first possible model, because dependent variables are ordinal. The assumption of the ordered *logit* model is that odds in each category have the same ratio. Another possible model is the ordered *probit* model (McKelvey & Zavoina, 1975). There is little difference in terms of estimates between the ordered *probit* model and the ordered logit model. I used a *logit* specification because analysis using *logit* generates statistically thorough results. In addition, I used a random-effects model by clustering a manager, because this study is concerned with the impact of variables that change over time as well as that of variables that do not change over time.

Results

Table 22 and 23 present descriptive statistics and correlations for variables in the two R&D centers used in this study. The table shows that there are significant correlations among several predictor variables and control variables. To check the multicollinearity, variance inflation factors (VIF) were obtained from each regression equation. The range of VIF factors is from 1.03 to 2.86, which is below the rule-of-thumb cut-off of 10 (Hair et al., 1998).

Table 22: Means, Standard Deviations, and Correlations (Mobile phone R&D center)

No		Mean	St. dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ambidextrous work assignment (t+1)	0.32	0.47	0	1															
2	Exploration work assignment (t+1)	0.28	0.45	0	1	0.5*														
3	Ambidextrous work assignment (t)	0.25	0.43	0	1	0.7*	0.22*													
4	Exploration work assignment (t)	0.14	0.35	0	1	-0.02	0.5*	-0.23*												
5	Age (t)	39.02	2.52	33	50	0.01	0.09	0.02	0.09											
6	Tenure (t)	10.55	3.30	3	24	0.03	-0.01	0.01	0.00	0.59*										
7	Education==Bachelor	0.41	0.49	0	1	-0.14	-0.10	-0.10	-0.08	0.26*	0.18*									
8	Education==Doctor	0.03	0.16	0	1	0.18*	0.12	0.19*	-0.07	-0.14*	-0.19*	-0.14*								
9	Education==Master	0.56	0.50	0	1	0.08	0.06	0.03	0.10	-0.21*	-0.11	-0.95*	-0.19*							
10	Individual performance	2.55	0.54	1	3	0.07	0.05	0.13*	0.04	-0.18*	-0.14*	0.00	-0.02	0.01						
11	Competency (t)	5.97	0.42	4.58	6.81	0.38*	0.15	0.31*	-0.04	-0.17	-0.02	0.09	0.06	-0.12	0.2*					
12	Position==Manager (t)	0.68	0.47	0	1	-0.14	-0.12	-0.12*	0.07	-0.49*	-0.24*	0.11	-0.02	-0.10	0.23*	0.06				
13	Position==Senior manager	0.32	0.47	0	1	0.14	0.12	0.12*	-0.07	0.49*	0.24*	-0.11	0.02	0.10	-0.23*	-0.06	-1*			
14	Depart (research =0, development =1)	0.79	0.41	0	1	0.08	0.01	0.10	-0.16*	-0.02	-0.02	-0.07	0.08	0.04	0.06	-0.16	0.00	0.00		
15	Exploitation (department) (t)	30.02	16.20	0	48	0.17*	0.14	0.14*	-0.12*	0.00	-0.08	-0.02	0.07	0.00	0.05	-0.15	-0.10	0.10	0.82*	
16	Exploration (department) (t)	9.22	7.05	0	1	0.27*	0.29*	0.18*	0.02	0.12*	-0.08	0.00	0.00	0.00	0.01	-0.09	-0.19*	0.19*	0.57*	0.81*

p* < 0.05

Table 23: Means, Standard Deviations, and Correlations (Central R&D center)

No	Variable	Mean	St. dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Ambidextrous work assignment (t+1)	0.29	0.45	0	1													
2	Exploration work assignment (t+1)	0.23	0.42	0	1	-0.35*												
3	Ambidextrous work assignment (t)	0.26	0.44	0	1	0.21*	0.04											
4	Exploration work assignment (t)	0.24	0.43	0	1	-0.02	0.61*	-0.33*										
5	Age	39.42	3.67	33	51	-0.11*	-0.08	-0.14*	-0.12									
6	Tenure	10.19	5.52	1	27	-0.1	-0.16*	-0.11	-0.2*	0.72*								
7	Education==Bachelor	0.05	0.22	0	1	0	0.03	-0.01	0.05	0.07	-0.01							
8	Education==Doctor	0.22	0.42	0	1	-0.15*	0.29*	-0.15*	0.28*	0.05	-0.21*	-0.13*						
9	Education==Master	0.73	0.45	0	1	0.14*	-0.29*	0.14*	-0.28*	-0.09	0.2*	-0.39*	-0.87*					
10	Individual competency	5.98	0.35	4.96	6.8	0.09	0	0.41*	-0.15	-0.17*	-0.11	-0.09	-0.09	0.22*				
11	Individual performance	2.63	0.53	1	3	0.04	-0.06	0.08	-0.01	-0.31*	-0.14*	-0.03	-0.14*	0.26*	0.25*			
12	Position==Manager	0.29	0.46	0	1	0.18*	0.08	0.22*	0.07	-0.55*	-0.41*	-0.07	-0.11	0.18*	0.17*	0.1		
13	Position==Senior manager	0.71	0.46	0	1	-0.18*	-0.08	-0.22*	-0.07	0.55*	0.41*	0.07	0.11	-0.18*	-0.17*	-0.1	-1*	
14	Sequence (exploration to exploitation = 1)	0.47	0.5	0	1	.	.	0.33*	0.53*	-0.01	-0.06	0.06	-0.04	0.03	0.01	-0.01	-0.02	0.02

$p^* < 0.05$

Any exploration work assignment (hypothesis 1)

Model 1 and 3 show the results for control variables (model 1 - $\chi^2 = 10.16$, $p > 0.1$, pseudo-$R^2 = 0.1$; model 3 - $\chi^2 = 10.16$, $p < 0.05$, pseudo-$R^2 = 0.04$); Model 2 and 4 contain the independent variables (model 2 - $\chi^2 = 36.76$, $p < 0.01$, pseudo-$R^2 = 0.27$; model 3 - $\chi^2 = 67.76$, $p < 0.01$, pseudo-$R^2 = 0.24$). The results suggest that contribution of independent variables (i.e., education, competency, individual performance, and any exploration work assignment) to model significance was superior to that of model 1 and 3.

Mobile phone R&D center: In the first model, only control variables were included. Model 1 shows that any individual characteristics are not significantly associated with the assignment of any exploration work. Model 2 shows that the previous any exploration work assignments have a significant and positive effect on the assignment of exploration work at the focal year ($\beta = 2.45$, $p < 0.001$, OR = 11.64). This result indicates that managers who were assigned any exploration work were 11.64 times more likely to be assigned exploration work in the subsequent year.

Central R&D center: Model 3 included only control variables. There were no individual characteristics which are significantly associated with the assignments of any exploration work. Model 4 shows that individual competency has a marginally significant and positive effect on the assignment of any exploration work assignment ($\beta = 1.11$, $p < 0.1$, OR = 2.43), indicating that managers with one unit higher competency evaluation were 2.43 times more likely to be assigned any exploration work. Model 4 also shows that the previous any exploration work assignments is positively and significantly associated with the assignment of exploration work at the focal year ($\beta = 2.5$, $p < 0.001$, OR = 11.36), suggesting that managers with the previous any exploration work were 11.36 times more likely to be assigned any exploration work.

I find weak evidence for hypothesis 1. Individual competency is positively associated with the assignment of any exploration work in the central R&D centers. However, this positive effect is marginal. In the mobile R&D center, only previous any exploration work assignment has a significant and positive

effect on the subsequent exploration work assignment. These results can be interpreted in two ways. First, this firm may not assign exploration work to managers who have higher levels of skills and knowledge. Second, individual competency is more extensively used to judge individual skills and knowledge. I also find that the previous exploration (ambidextrous) work assignments strongly increase the probability of the assignment of exploration (ambidextrous) work. This implies that the previous work assignments are used to judge individual knowledge and capabilities rather than individual educational level or assessed competency.

Table 24: Results of Logistic Regression of Any Explore Work (cluster: manager)

Logit Estimation

	Mobile phone R&D center						Central R&D center					
	DV: Any exploration work (t+1)											
	model 1			model 2			model 3			model 4		
Variables	β	s.e.	Odds ratio	β	s.e.	Odds ratio	β	s.e.	Odds ratio	β	s.e.	Odds ratio
Age (t)	-0.060	(0.148)	0.89	0.067	(0.171)	1.07	0.004	(0.070)	1.02	-0.078	(0.068)	0.94
Tenure (t)	0.008	(0.084)	1.00	-0.023	(0.080)	0.98	-0.067	(0.044)	0.92	-0.018	(0.040)	0.98
Position==Manager (t)	0.150	(0.655)	0.90	0.659	(0.684)	1.93	0.394	(0.304)	1.54	-0.156	(0.332)	0.88
Depart (research =1, development = 0)	0.722	(3.840)	0.03	-0.438	(3.489)	0.65						
Exploitation (department) (t)	-0.108	(0.153)	1.11	-0.052	(0.149)	0.95						
Exploration (department) (t)	0.286	(0.181)	1.01	0.219	(0.189)	1.25						
Individual performance (t)*										**-0.369**	**(0.301)**	**0.86**
Competency (t)				**-0.336**	**(0.732)**	**0.71**				**0.987 †**	**(0.514)**	**2.43**
Education==Bachelor				**-0.381**	**(0.674)**	**0.68**				**-0.647**	**(0.899)**	**0.53**
Education==Doctor				**0.563**	**(0.912)**	**1.76**				**0.445**	**(0.411)**	**1.52**
Any exploration work (t)				**2.454*** **	**(0.648)**	**11.64**				**2.507*** **	**(0.351)**	**11.36**
Constant	1.184	(5.389)		-3.450	(7.630)		0.525	(2.581)		-2.315	(3.965)	
N		114			114			202			202	
Log likelihood		-57.24			-46.24			-187.52			-148.04	
$\chi 2$ (df)		10.16 (6)			36.76 (10)			7.35 (3)			67.67 (7)	
Pseudo-R2		0.1			0.27			0.04			0.24	

* In the mobile phone R&D center, only long-term performance (3 year) was measured. Thus, individual performance is excluded.

Ambidextrous and exploration work assignments

Model 5 and 7 display the results for control variables (model 5 - $\chi^2 = 4.72$, $p > 0.1$, pseudo-R^2 = 0.11; model 7 - $\chi^2 = 0.36$, $p > 0.1$, pseudo-$R^2 = 0.003$); Model 6 and 8 show the results for the independent variables (model 6 - $\chi^2 = 46.97$, $p < 0.001$, pseudo-$R^2 = 0.55$; model 8 - $\chi^2 = 755.95$, $p < 0.01$, pseudo-$R^2 = 0.39$). The results indicate significant contribution of independent variables to model.

Mobile phone R&D center: Model 5 included only control variables. There were no control variables which have a significant effect. Model 6 shows that tenure has a significant and positive effect in predicting the assignment of ambidextrous work ($\beta = 0.37$, $p < 0.05$, OR = 0.98). Ambidextrous work assignments have a significant effect in predicting assignment of ambidextrous work ($\beta = 4.26$, $p < 0.001$, OR = 11.64), indicating that managers with the previous ambidextrous work were 11.64 times more likely to be given ambidextrous work. These imply that work is assigned to managers based on previous work experience rather than individual competency or education background.

Data in the central R&D: Model 7 included only control variables. No control variables are shown to have significant effect. Model 8 shows that tenure is negatively and significantly related to assignment of ambidextrous work ($\beta = -0.90$, $p < 0.05$, OR = 0.83), indicating that managers with longer tenure are more likely to be assigned to exploration work. The assignment of ambidextrous work in the previous year is negatively and significantly associated with assignment of exploration work in the focal year ($\beta = -18.97$, $p < 0.001$, OR = 0.00) and assignment of exploration work in the previous year is also negatively and significantly associated with assignment of exploration work in the focal year ($\beta = -19.74$, $p < 0.001$, OR = 0.00). These results indicate that managers who experienced exploration or ambidextrous work are more likely to be assigned to exploration work than ambidextrous work. Education (Ph.D.) is negatively and significantly associated with assignment of ambidextrous work ($\beta = -2.51$, $p < 0.01$, OR = 0.08). It suggests that managers with Ph.D. degrees are more likely to be assigned to exploration work than ambidextrous work. In sum, exploration work is assigned to individuals who have higher levels of education. Thus, hypothesis 2a is partially supported.

Table 25: Results of Logistic Regression of Explore and Ambidextrous Work (cluster: manager)

Logit Estimation

	Mobile phone R&D center						Central R&D center					
	DV: Ambidextrous work (t+1)											
	model 5			model 6			model 7			model 8		
Variables	β	s.e.	Odd ratio	β	s.e.	Odd ratio	β	s.e.	Odd ratio	β	s.e.	Odd ratio
Age (t)	-0.370	(0.218)	0.94	-0.278	(0.403)	1.07	-0.011	(0.110)	1.00	0.131	(0.166)	1.14
Tenure (t)	0.166	(0.115)	1.01	0.317*	(0.139)	0.98	-0.007	(0.055)	0.99	-0.190*	(0.089)	0.83
Position==Manager (t)	-1.068	(0.939)	1.16	1.316	(1.363)	1.93	0.154	(0.623)	1.23	0.694	(0.744)	2.00
Depart (research =1, development = 0)	0.597	(4.170)	2.06	3.288	(7.450)	0.65						
Exploitation (department) (t)	0.048	(0.158)	0.90	-0.213	(0.262)	0.95						
Exploration (department) (t)	-0.088	(0.194)	1.33	0.440	(0.323)	1.25						
Individual performance (t)*							**-0.132**	**(0.411)**		**-0.279**	**(0.622)**	**0.76**
Competency (t)**										**0.905**	**(0.633)**	**2.47**
Education==Bachelor				**-1.105**	**(1.050)**	**0.71**				**-1.482**	**(0.924)**	**0.23**
Education==Doctor				**0.000**	**(.)**	**0.68**				**-2.513***	**(1.053)**	**0.08**
Exploration work assignment (t)				**-2.173**	**(1.179)**	**1.76**				**-18.976*****	**(1.256)**	**0.00**
Ambidextrous work assignment (t)				**4.256*****	**(1.283)**	**11.64**				**-19.745*****	**(1.152)**	**0.00**
Constant	13.269	(7.844)		7.155	(15.250)		1.015	(4.672)		11.522	(7.537)	
N	67			63***			109			109		
Log likelihood	-35.75			-17.37			-74.29			-45.64		
$\chi 2$ (df)	4.72 (6)			46.97 (10)			0.36 (4)			755.95 (10)		
Pseudo-R2	0.11			0.55			0.003			0.39		

* In the mobile phone R&D center, only long-term performance (3 year) was measured. Thus, individual performance is excluded.
** In the mobile phone R&D center, the model including individual competency did not generate result.
*** In the mobile phone R&D center, all individuals who have PhD degrees were assigned to ambidextrous work. Thus, the number of observation decreased from 67 to 63.

Short-term performance

Model 9 shows the results for control variables ($\chi2 = 25.37$, $p < 0.01$, pseudo-R2 = 0.1). Model 10 displays the results for the independent variable (model 10 - $\chi2 = 25.65$, $p < 0.001$, pseudo-R2 = 0.12). The results suggest that a model which includes independent variables contributes to model significance. Individual performance in the previous year has a significant effect on current individual performance ($\beta = 0.93$, $p < 0.01$, OR = 2.55), indicating that managers with one unit higher individual performance were 2.55 times more likely to have higher subsequent individual performance. Model 8 shows that assignment of ambidextrous work is positively and significantly associated with individual short-term performance ($\beta = 1.12$, $p < 0.05$, OR = 3.06). This indicates that managers who were assigned ambidextrous work were 3.06 times more likely to have higher short-term performance.

Table 26: Results of Logistic Regression of Performance (short-term, cluster: manager)

Central R&D center

	model 9			model 10		
	DV: Performance (short-term)					
Measure	B	s.e.	Odd ratio	β	s.e.	Odd ratio
Individual performance (t)	0.934**	(0.349)	2.55	0.967**	(0.354)	2.63
Individual competency (t)	0.721	(0.612)	2.06	0.287	(0.639)	1.33
Age (t)	-0.105	(0.073)	0.90	-0.110	(0.072)	0.90
Tenure (t)	0.034	(0.033)	1.03	0.038	(0.034)	1.04
Education==Bachelor	-0.127	(0.453)	0.88	-0.081	(0.482)	0.92
Education==Doctor	0.286	(0.400)	1.33	0.358	(0.402)	1.43
Position==Manager (t)	0.399	(0.428)	1.49	0.308	(0.425)	1.36
Ambidextrous work assignment (t)				**1.119***	**(0.489)**	**3.06**
cut1						
Constant	-0.362	(4.654)		-2.855	(4.743)	
cut2						
Constant	2.489	(4.565)		0.054	(4.651)	
N	168			168		
Chi-square	25.31			25.65		
df	7			8		
-2 log likelihood	-119.58			-116.57		
Pseudo R2	0.1			0.12		

Long-term performance[5]

In the mobile phone R&D center, performance was evaluated based on three year observation. Model 11 shows the results of a model which includes control variables ($\chi^2 = 11.29$, $p < 0.05$, pseudo-$R^2 = 0.16$). Model 12-15 show the results for four different independent variables (model 12 - $\chi^2 = 16.11$, $p < 0.001$, pseudo-$R^2 = 0.23$; model 13 - $\chi^2 = 17.11$, $p < 0.01$, pseudo-$R^2 = 0.25$; model 14 - $\chi^2 = 18.21$, $p < 0.001$, pseudo-$R^2 = 0.26$; model 15 - $\chi^2 = 18.43$, $p < 0.001$, pseudo-$R^2 = 0.27$). The results suggest that independent variables contribute to model fit. Models 12 to 15 show that all variables related to assignment of ambidextrous work are positively and significantly associated with individual long-term performance. Specifically, assignment of ambidextrous work in the first period ($\beta = 2.01$, $p < 0.05$, OR = 7.5) and in the second period ($\beta = 2.1$, $p < 0.05$, OR = 8.21) has a significant and positive effect on individual long-term performance. The two variables which were created using type of work assignment in both periods also show a significant and positive effect on individual long-term performance: concurrent ambidextrous work assignment ($\beta = 2.29$, $p < 0.05$, OR = 9.83) and temporal ambidextrous work assignment ($\beta = 2.01$, $p < 0.05$, OR = 7.5). These results suggest that the assignment of ambidextrous work is beneficial to individual long-term performance.

[5] A 3-year period may not be long-term individual performance. The definitions of short-term and long-term for individual performance vary. In this dissertation, I used the long-term individual performance to distinguish it from the short-term individual performance.

Table 27: Results of Logistic Regression of Performance (long-term, cluster: manager)

Mobile phone R&D center

	model 11			model 12			model 13			model 14			model 13		
	DV: performance (long-term) - period 3														
Measure	β	s.e.	Odd ratio	β	s.e.	Odd ratio	β	s.e.	Odd ratio	β	s.e.	Odd ratio	β	s.e.	Odd ratio
Individual competency (period 2)	0.799	(0.997)	2.22	0.617	(1.029)	1.85	0.076	(1.069)	1.08	-0.271	(1.080)	0.76	0.617	(1.029)	1.85
Age (08)	-0.416	(0.227)	0.66	-0.476	(0.251)	0.62	-0.486	(0.249)	0.62	-0.579*	(0.269)	0.56	-0.476	(0.251)	0.62
Tenure (08)	-0.041	(0.115)	0.96	-0.036	(0.124)	0.96	-0.077	(0.127)	0.93	-0.067	(0.130)	0.93	-0.036	(0.124)	0.96
Education==Bachelor	1.385	(0.776)	3.99	1.558	(0.844)	4.75	1.870*	(0.876)	6.49	1.993*	(0.900)	7.34	1.558	(0.844)	4.75
Education==Doctor	-1.055	(1.629)	0.35	-2.780	(1.911)	0.06	-2.639	(1.899)	0.07	-2.761	(1.921)	0.06	-2.780	(1.911)	0.06
Position==Manager (08)	-0.157	(0.753)	0.85	0.167	(0.823)	1.18	0.270	(0.845)	1.31	0.152	(0.837)	1.16	0.167	(0.823)	1.18
Depart (research =0, development =1) (08)	-0.604	(0.954)	0.55	-0.285	(1.006)	0.75	-0.080	(0.972)	0.92	0.001	(0.995)	1.00	-0.285	(1.006)	0.75
Constant	-11.59	(11.183)		-14.03	(12.007)		-17.37	(12.191)		-22.62	(13.090)		-14.03	(12.007)	
Ambidextrous work assignment															
Period 1				**2.014***	**(0.997)**	**7.50**									
Period 2							**2.105***	**(0.956)**	**8.21**						
Period 1 and 2										**2.286***	**(0.967)**	**9.83**			
Temporal													**2.014***	**(0.997)**	**7.50**
N	50			50			50			50			50		
Chi-square	11.29			16.11			17.11			18.21			18.43		
df	7			8			8			8			8		
-2 log likelihood	-28.97			-26.56			-26.04			-25.51			-25.4		
Pseudo R2	0.16			0.23			0.25			0.26			0.27		

p†<0.1, *p** < 0.05, *p*** < 0.01, *p**** < 0.001. ; two-tailed tests

Post Hoc Analyses

I conducted a chain of post hoc analyses to confirm the findings in this chapter and obtain further insight. First, I compare the ways of operationalizing ambidextrous work assignments in terms of individual outcomes. Two ways were suggested to conceptualize ambidextrous work assignments in this dissertation: to assign both exploration and exploitation simultaneously or to sequentially assign different types of work by assigning a manager to exploration first and to exploitation later, or vice versa.

The first conceptualization is rooted in contextual ambidexterity (Gibson & Birkinshaw, 2006). Individuals are allowed to decide their own how to allocate their time and energy to exploration and exploitation (Gibson & Birkinshaw, 2006). However, some researchers deny the possibility that individuals can pursue exploitation and exploration harmoniously at the same time. Duncan (1976) insisted that organizational structure should enable individuals to work innovatively because individuals are not inherently innovative. O'Reilly and Tushman (2008) argue that ambidexterity cannot be rooted in individual ability. In addition, they argued that all managers need not be ambidextrous. This implies that concurrent execution of exploration and exploitation causes enough tension to offset the positive effect of ambidextrous work assignments.

The second conceptualization originated from the notion of temporal separation. Individuals switch between exploration and exploitation in a temporal fashion: exploration is implemented at a certain time and exploitation is executed at a subsequent time, or vice versa. Thus, individuals in temporal separation feel less tension or contradictions than in concurrent execution. While ambidextrous work assignments in temporal separation provide a challenging work environment, the level of tension is relatively low.

To investigate the effect of the two different operationalizations for ambidextrous work on individual outcome, I regressed the two ways of operationalizations against individual competency[6]. I

[6] Two ways of operationalizations of ambidextrous work assignments can be compared only in the mobile R&D center because only one project was assigned to managers at a time in the central R&D center. In this analysis, the dependent variable is individual competency because individual performance was evaluated for 3 year observation.

found that ambidextrous work assignment using concurrent execution is not significantly associated with individual competency, whereas ambidextrous work assignments using temporal separation is significantly associated with individual competency ($\beta = 0.24$, $p < 0.05$). These results indicate that the assignment of exploration at a certain time and exploitation at a subsequent time vice versa is a more effective way to assign individuals with ambidextrous work.

Table 28: Results of Linear Regression of Competency (cluster: manager)

Mobile phone R&D center						
	model 14		model 15		model 16	
	Individual competency (t+1)					
Measure	β	s.e.	β	s.e.	β	s.e.
Individual competency (t)	0.794***	(0.180)	0.726***	(0.191)	0.774***	(0.162)
Tenure (t)	-0.006	(0.017)	-0.003	(0.017)	-0.004	(0.016)
Education==Bachelor	-0.020	(0.119)	-0.000	(0.116)	-0.032	(0.116)
Education==Doctor	0.188	(0.371)	-0.020	(0.419)	0.030	(0.385)
Position==Manager (t)	-0.050	(0.125)	-0.001	(0.138)	-0.014	(0.130)
Depart (research =0, development =1)	-0.303	(0.580)	-0.627	(0.500)	-0.392	(0.626)
Exploitation (department) (t)	-0.047	(0.031)	-0.073*	(0.031)	-0.056	(0.034)
Exploration (department) (t)	0.027	(0.024)	0.046	(0.024)	0.034	(0.027)
Constant	0.958	(1.111)	1.168	(1.134)	0.881	(0.984)
Ambidextrous work assignment (Concurrent)			**0.271**	**(0.183)**		
Ambidextrous work assignment (Temporal)					**0.238***	**(0.116)**
N	40		40		40	
R-squared	0.4		0.45		0.46	
Adjusted R-squared	0.37		0.38		0.36	
F improvement of fit	3.7**		4.09***		5.26***	

I showed that the assignment of ambidextrous work using temporal separation leads to better individual performance. In addition, there may difference between two sequences of temporal separation. Regarding temporal separation, ambidextrous work assignments have two sequences: exploration to exploitation and exploitation to exploration. In the exploration and exploitation literature, exploitation is perceived as stable, routine, and variance-decreasing activity, whereas exploration is regarded as uncertain, risky, and variance-increasing activity (Burgelman, 2002; March, 1991; March & Levinthal, 1993). The contrasting characteristics of exploration and exploitation may have an order effect on individual performance. Katz (1980) found that new employees are more concerned about interactions with co-workers and their managers in the early career stage to order to establish role identity and to develop social and interpersonal relationships. After that, their concerns head toward tasks that contribute to or influence organizational performance by their ability. This implies that ordered or sequenced experience can motivate individuals and then maximize their outcomes.

In line with these arguments, two sequences of ambidextrous work assignments in temporal separation may influence individual performance. Technology or target customers of exploitation are already known to a focal firm (Raisch & Birkinshaw, 2008; Lavie et al., 2010). Individuals are familiar with skills and knowledge of exploitation. They have low levels of uncertainty and risk. On the other hand, technology or target customers of exploration are new to a focal firm (Raisch & Birkinshaw, 2008; Lavie et al., 2010). Individuals are not familiar with the skills and knowledge of exploration and thus have high levels of uncertainty and risk. In the sequence of exploration to exploitation, managers are motivated, but endure ambiguity in the exploration stage. In the exploitation stage, they have buffers to being stressed due to high uncertainty. On the other hand, in the sequence of exploitation to exploration, managers are not under high uncertainty, but are less motivated in the exploitation stage. In the exploration stage, they face high ambiguity and uncertainty and are motivated. The degree of perception of ambiguity and uncertainty is higher than that in the exploration stage of the second sequence (exploitation to exploration). Therefore, the sequence from exploration and exploitation in ambidextrous

work assignments has a more positive effect on individuals' performance.

To examine the effect of the two different sequences for the assignment of ambidextrous work using temporal separation on individual outcome, I regressed the two sequences against individual performance. I found that the sequence from exploration to exploitation is significantly and positively associated with individual performance compared with the sequence from exploitation to exploration ($\beta = 1.24$, $p < 0.05$). These results indicate that the assignment from exploration to exploitation is more beneficial to managers in enhancing their individual performance when ambidextrous work needs to be assigned a manager.

Table 29: Results of Linear Regression of Competency (cluster: manager)

Central R&D center						
	model 17			model 18		
	DV: Performance (short-term)					
Measure	β	s.e.	Odd ratio	β	s.e.	Odd ratio
Individual performance (t)	2.615*	(1.253)	13.67	1.212 †	(0.719)	13.72
Individual competency (t)	-2.074	(1.672)	0.13	-1.421 †	(0.795)	0.10
Age (t)	0.171	(0.219)	1.19	0.089	(0.147)	1.13
Tenure (t)	-0.055	(0.145)	0.95	0.001	(0.070)	1.00
Education==Bachelor	14.894***	(1.769)	2.9E+06	5.020***	(0.761)	4.1E+07
Education==Doctor	16.109***	(0.949)	9.9E+06	5.619***	(0.529)	7.9E+07
Position==Manager (t)	-1.707	(1.337)	0.18	1.697	(1.133)	0.10
Sequence (exploration to exploitation = 1)				**1.023***	**(0.501)**	**5.73**
cut1						
Constant	-2.163	(10.533)		-2.042	(6.961)	
N		45			45	
Chi-square		488.06			267.8	
Df		7			8	
-2 log likelihood		-15.12			-13.37	
pseudo R2		0.28			0.37	

5.5 – Conclusion

This chapter developed hypotheses to unpack ambidexterity at the individual level based on the literature review in the previous chapter. The following table summarizes the results of all hypotheses in this chapter.

Table 30: Overview of Hypotheses (Individual outcome)

	Dependent variable	Independent variable
Antecedents (H1, 2a, and 2b)	Any exploration work assignments	Education (+), Competency (+) - Individual performance (+)
	Ambidextrous work assignments	Education (+), Competency (+) - Individual performance (+)
	Exploration work assignments	Education (+), Competency (+) - Individual performance (+)
Direct relationship (H3)	Short-term Individual performance	Ambidextrous work assignment (+)
	Long-term individual performance	Ambidextrous work assignment (+)

CHAPTER 6

DISCUSSION AND CONCLUSTION

Since Tushman and O'Reilly (1996) proposed that organizations need to be ambidextrous to gain long-term firm performance, theoretical and empirical research has deepened our understanding of organizational ambidexterity. Previous research illustrated the positive effect of organizational ambidexterity on organizational performance (Cao et al., 2009; Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin et al., 2006; Venkatraman, et al., 2006), suggested the ways in which organizations become ambidextrous (Cao et al., 2009; Gibson & Birkinshaw, 2004: He & Wong, 2004; Jansen et al., 2009; Tushman & O'Reilly, 1996) and found organizational or environmental factors which facilitate organizational ambidexterity (Jansen et al., 2008). However, the understanding of ambidexterity at the operational level or at the individual level has been left underexplored. Accordingly, the purpose of this dissertation was to enrich conceptual and empirical understanding about 1) who is assigned to exploration, exploitation, or both activities 2) how the assignment of different types of work influence individual and project outcomes; and 3) what individual or organizational factors influence the relationship between work assignments and individual outcomes.

6.1 – Discussion of Findings

In this dissertation, I address how exploration and exploitation are assigned to project managers and how the three types of work assignments (i.e., exploration, exploitation, and ambidextrous work assignments) influence individual performance and project performance. Most studies in ambidexterity presumed that it is difficult for individuals to be ambidextrous because individuals need to have behavioral capability (Gibson & Birkinshaw, 2004) or hold paradoxical thinking (Smith & Tushman, 2005). However, I argued that ambidextrous work assignments provide a favorable work environment for managers to implement exploration and exploitation more effectively compared with only exploration or

exploitation work assignments. This dissertation informs on these elements which are under-explored in the ambidexterity literature.

Regarding antecedent of work assignments, results suggested that organizations assign difficult work (exploration and ambidextrous work assignments) to individuals who have high levels of skills, capabilities and knowledge. Specifically, I found that exploration and ambidextrous work were assigned to managers who have higher levels of education (Ph.D.) and competency. However, previous individual performance is not related to the assignment of exploration and ambidextrous work. This implies that organizations strategically assigned exploration and exploitation to project managers in order to achieve higher organizational performance through higher project performance.

Regarding outcomes of work assignments, I found that ambidextrous work assignments have a positive effect on short-term individual performance (1 year), long-term individual performance (3 years), and promotion to a senior manager position compared with exploitation and exploration work assignments. These results are consistent with arguments in the current ambidexterity literature that ambidextrous individuals are positively associated with individual performance (Mom et al., 2009). However, the underlying logic to support such relationship is different. In the previous research, ambidextrous individuals are presumed to have higher performance due to capability and ability (Gibson & Birkinshaw, 2004; Mom et al., 2009). In this study, I argue that the positive relationship between ambidextrous work assignments and individual performance results from an advantageous work environment of ambidextrous work assignments as well as individual capability and ability.

6.2 – Contributions and Implications

This study contributes to current literature on ambidexterity in several ways. This study provides a general contribution to present studies on ambidexterity by clarifying roles of top managers, middle managers, and non-managerial individuals. Characteristics and roles of top managers or the top management team have been extensively studied because top managers take strategic roles to integrate

and differentiate exploration and exploitation (Abraham & Halevi, 2009; Cao et al., 2010; Jansen et al., 2009; Lubatkin et al., 2006; O'Reilly & Tushman, 2008). On the other hand, middle managers or non-managerial individuals are underexplored because they are assumed not to play important roles in achieving organizational ambidexterity. However, they play intermediate roles to connect top managers in the strategic level with non-managerial individuals in the operational level in a structurally ambidextrous organization. In a contextually ambidextrous organization, they take active roles to achieve organizational ambidexterity.

This study contributes to studies on ambidexterity at the individual level. Exploration and exploitation become work assignments when they are fulfilled in the operational level by middle managers and non-managerial individuals. The meanings of exploration and exploitation are interpreted differently by middle managers and non-managerial individuals. Exploration and exploitation are usually compared in terms of riskiness, ambiguity, and non-routineness (Lavie et al., 2010). In addition to these characteristics of the two, exploration and exploitation can be compared in terms of degree of a challenging work environment. Exploration provides a challenging work environment for individuals to have the opportunity to learn and to be motivated, while it holds high levels of riskiness, ambiguity, and non-routineness (McCauley et al., 1994). On the other hand, exploitation offers a less-challenging work environment, while it has low levels of riskiness, ambiguity, and non-routineness (McCauley et al., 1994).

Given the different work environments which exploration and exploitation provide, three types of work assignments (i.e., exploration, exploitation, and ambidextrous work assignments) generate different work experience. Ambidextrous work assignments provide work environments with a mixture of those in both exploration and exploitation. This implies that ambidextrous work assignments are beneficial to individual performance as ambidexterity at the organizational level is beneficial to organizational performance.

This study suggested a new way to conceptualize individual ambidexterity. In this study, ambidexterity at the individual level (ambidextrous work assignments) was operationalized using past

project assignments. Specifically, two ways were suggested to measure ambidextrous work assignments: concurrent execution and temporal separation. The two operationalizations clarify how individuals become ambidextrous. In addition, Mom et al. (2009) used perceptual scales to measure manager's ambidexterity with a cross-sectional research design. They pointed out that future studies need to adopt objective measures for individual ambidexterity to overcome weaknesses of a common method bias. In addition, longitudinal approach helped reveal causality.

This study also contributes to R&D management research. In the R&D management literature, one of key issues is how to assign R&D projects to project managers and members in order to gain high performance in R&D projects (Brown & Eisenhardt, 1995; Pinto & Slevin, 1989; Souder & Jenssen, 1999). This implies that the success or failure of a project largely depends on who manages it. This study's findings suggested that the assignments of both exploration and exploitation are more beneficial to individual or project performance than the assignments of either exploration or exploitation only. This study also found that previous project assignments are positively associated with following assignments of the same type. This implies that project managers tend to have similar types of projects continuously. Thus, firms need to strategically assign ambidextrous work to project managers or members to increase individual performance.

6.3 – Limitations and Future Research

Limitations

Like all empirical research, this study has limitations. First, data was collected for four years in the two R&D centers. The longitudinal approach contributes to revealing the causality between ambidextrous work assignments and individual and project performance. However, a four year observation period does not provide the full history of individual project assignments. The full history of individual project assignments can provide more thorough analysis of the effect of work assignments on individual performance by eliminating the effect of unobserved work assignments. In addition, managers

who quit or were fired were not included. This may generate survivorship bias, a type of selection bias which comes from focusing on the managers who survived.

One of the key variables in this study is individual competency. I provided the results of factor analysis for individual competency to show the validity and reliability of measures for individual competency. However, measures for individual competency are not validated ones. Thus, the use of validated measures for individual competency can increase insight into the relationship between different types of work assignments and individual competency (Hogen et al., 2006).

Third, this study focused on the individual level, revealing the meaning of ambidextrous work assignments and their effect on individual performance. An interesting extension of this study would be to investigate organizational (or team level) factors which influence the relationship between work assignments and their effect on individuals. Team characteristics such as team diversity and team cohesion may have an effect on the relationship between work assignments and individual performance. In addition, organizational factors such as a reward system for projects can also have an effect on such relationships.

Lastly, the industry where this firm is competing has experienced speedy technological innovation. Thus, two R&D centers have high levels of exploration compared with traditional manufacturing industry.

In the traditional manufacturing industry, few people are involved in exploration due to the low level of exploration. Thus, a firm may have a different unit for exploration and exploitation (structural separation) to handle exploration and exploitation effectively. Thus, the results in this study may not be generalizable to industries in which the change of technology is not fast.

Future Research

Regarding direction for future research, more attention needs to be paid to clarification of the meanings of exploration, exploitation and ambidexterity at different levels. Previous studies focused on

the organizational level (March, 1991; Siggelkow, 2003; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). However, there is still debate on the definitions of exploration and exploitation in the organizational level (Lavie et al., 2010). In this study, I found that exploration and exploitation are differently interpreted by actors at the operational level. This implies that we investigate exploration, exploitation, and ambidexterity with different meanings of the three concepts and any findings are limited to the generalization of other contexts. Future research needs to clarify the meanings of exploration, exploitation, and ambidexterity to advance ambidexterity literature.

Second, there is little research on linking individual ambidexterity and organizational ambidexterity. Individual ambidexterity may or may not be positively associated with organizational ambidexterity. The relationship between individual and organizational ambidexterity depends on the approaches which a firm uses to achieve organizational ambidexterity. In a structurally ambidextrous organization, individual ambidexterity is not positively related to organizational ambidexterity (Jansen et al., 2009). Managers and non-managerial individuals focus on either exploration or exploitation. In a contextually ambidextrous organization, individual ambidexterity may be positively associated with organizational ambidexterity (Gibson & Birkinshaw, 2004). If a firm uses multiple approaches for organizational ambidexterity, the relationship between individual and organizational ambidexterity is more complicated. Thus, I call on future research to investigate the linkage between individual and organizational ambidexterity.

Appendix A: Factor analysis of competency assessment data

It is important to assess the reliability and validity of the scales and to determine whether the items accurately measure the intended construct because the assessment items are custom created for this firm rather than part of a validated survey instrument with standard scales. I did this in three ways: First, I conducted exploratory factor analysis to verify that there are three distinct competency constructs being measured by the different categories of raters. I then conducted an item analysis for each of the scales. After identifying robust scales for each construct as measured by different categories of raters, I examined the correlations among the items and the predictive power of the scales across raters. As a final step, I examined alternative approaches to combining the competency evaluations provided by different raters into a composite score for each competency as well as an overall competency assessment score. Two items (virtuous leader versus charismatic leader and risk taking versus risk management) were excluded from the exploratory factor analysis because the two items were developed separately from three competencies.

Subordinate

Twenty-one items were used for the exploratory factor analysis. (Table 30 and 31 for basic statistics and correlations) I used promax rotation because oblique rotation is recommended when correlations are high among factors. The exploratory factor analysis using promax rotation and the three factors option generated unclean loading patterns. (Table 32) Then, I eliminated items with loading of less than 0.4 and items which exhibited cross-loading greater than 0.3 (Osborne & Costello, 2004): dream/vision, determination, communication 2, creativity/self-discipline, emphasis on performance 2, talent development, and teamwork/cooperation. Then I ran factor analysis again with 15 items, which generated clean loading patterns. (Table 33) Finally, seven items for customer-related competency were identified, three items for people-related competency were identified, and six items for ethics-related competency were identified.

Table 31: Descriptive Statistics and Scale Items Based on Subordinate Evaluations (N=751)

Competency (* indicates included in final validated scale)	Survey item of subordinate	Mean	sd	Min	Max
Customer *	commitment to improvement	6.00	1.21	1	7
Customer *	decisiveness	5.89	1.31	1	7
Customer *	desire to lead	5.82	1.28	1	7
Customer	determination	6.14	1.15	1	7
Customer	dream/Vision	5.69	1.46	1	7
Customer *	emphasis on customer	5.95	1.18	1	7
Customer *	insight	5.90	1.35	1	7
Customer *	readiness for the future	5.84	1.34	1	7
People *	communication 1	5.81	1.50	1	7
People	communication 2	5.85	1.36	1	7
People	creativity/Self-discipline	5.80	1.40	1	7
People *	emphasis on performance 1***	5.88	1.30	1	7
People	emphasis on performance 2	5.83	1.32	1	7
People *	respect for diversity	5.71	1.48	1	7
People *	respect for people	5.95	1.40	1	7
People	talent Development	5.88	1.32	1	7
People	teamwork/Cooperation	5.90	1.34	1	7
Ethics *	dedication	6.00	1.24	1	7
Ethics *	emphasis on principle	6.20	1.09	1	7
Ethics *	fair competition	6.18	1.12	1	7
Ethics *	fair Treatment	6.10	1.19	1	7
Ethics *	honest reporting	6.16	1.14	1	7
Ethics *	resolute action	6.12	1.10	1	7
Virtuous vs. charismatic**		3.78	1.72	1	6
Risk taking vs. risk management**		4.49	1.39	1	6

** excluded from factor analysis

*** This item moved from people-related competency to customer-related competence

Table 32: Correlations Among Survey Items of Subordinate

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Commitment to improvement																								
2	Decisiveness	0.77*																							
3	Desire to lead	0.81*	0.77*																						
4	Determination	0.76*	0.76*	0.71*																					
5	Dream/Vision	0.79*	0.78*	0.77*	0.65*																				
6	Emphasis on customer	0.78*	0.74*	0.79*	0.72*	0.74*																			
7	Insight	0.81*	0.79*	0.80*	0.76*	0.76*	0.78*																		
8	Readiness for the future	0.80*	0.79*	0.80*	0.71*	0.79*	0.79*	0.82*																	
9	Communication 1	0.70*	0.67*	0.72*	0.60*	0.75*	0.69*	0.68*	0.70*																
10	Communication 2	0.74*	0.77*	0.74*	0.70*	0.79*	0.74*	0.76*	0.76*	0.80*															
11	Creativity/ Self-discipline	0.77*	0.75*	0.76*	0.70*	0.80*	0.75*	0.77*	0.78*	0.83*	0.81*														
12	Emphasis on performance 1	0.76*	0.73*	0.75*	0.69*	0.76*	0.77*	0.76*	0.79*	0.72*	0.75*	0.79*													
13	Emphasis on performance 2	0.78*	0.76*	0.77*	0.72*	0.80*	0.79*	0.79*	0.81*	0.77*	0.80*	0.81*	0.86*												
14	Respect for diversity	0.70*	0.65*	0.69*	0.62*	0.73*	0.68*	0.69*	0.71*	0.83*	0.76*	0.82*	0.73*	0.76*											
15	Respect for people	0.70*	0.61*	0.66*	0.62*	0.73*	0.69*	0.69*	0.67*	0.82*	0.75*	0.81*	0.72*	0.75*	0.83*										
16	Talent Development	0.77*	0.75*	0.74*	0.70*	0.79*	0.75*	0.77*	0.77*	0.78*	0.80*	0.83*	0.79*	0.80*	0.78*	0.81*									
17	Teamwork /Cooperation	0.76*	0.71*	0.72*	0.71*	0.74*	0.77*	0.74*	0.75*	0.75*	0.77*	0.78*	0.75*	0.78*	0.75*	0.78*	0.79*								
18	Dedication	0.75*	0.71*	0.71*	0.68*	0.73*	0.75*	0.73*	0.75*	0.73*	0.76*	0.76*	0.79*	0.81*	0.72*	0.75*	0.79*	0.79*							
19	Emphasis on principle	0.74*	0.65*	0.68*	0.69*	0.67*	0.69*	0.67*	0.70*	0.68*	0.70*	0.74*	0.71*	0.74*	0.69*	0.72*	0.76*	0.76*	0.78*						
20	Fair competition	0.73*	0.69*	0.69*	0.71*	0.69*	0.71*	0.72*	0.71*	0.72*	0.76*	0.76*	0.76*	0.78*	0.74*	0.77*	0.79*	0.75*	0.80*	0.84*					
21	Fair Treatment	0.72*	0.70*	0.70*	0.67*	0.69*	0.69*	0.72*	0.71*	0.73*	0.75*	0.76*	0.76*	0.77*	0.74*	0.77*	0.79*	0.75*	0.80*	0.84*	0.88*				
22	Honest reporting	0.69*	0.68*	0.64*	0.69*	0.65*	0.68*	0.68*	0.69*	0.66*	0.69*	0.69*	0.72*	0.73*	0.69*	0.72*	0.73*	0.74*	0.77*	0.80*	0.82*	0.82*			
23	Resolute action	0.73*	0.72*	0.70*	0.72*	0.70*	0.74*	0.72*	0.74*	0.68*	0.72*	0.75*	0.74*	0.77*	0.69*	0.73*	0.75*	0.79*	0.80*	0.83*	0.83*	0.81*	0.82*		
24	Virtuous vs. charismatic	0.11*	0.19*	0.13*	0.16*	0.08	0.09	0.11*	0.12*	-0.07	0.05*	0.03	0.08	0.07	-0.06	-0.07	0.06	0.07	0.05	0.06	0.06	0.03	0.04	0.12*	
25	Risk taking vs. risk management	0.28*	0.23*	0.26*	0.23*	0.25*	0.25*	0.28*	0.30*	0.21*	0.23*	0.23*	0.24*	0.27*	0.22*	0.22*	0.25*	0.25*	0.24*	0.24*	0.24*	0.24*	0.26*	0.25*	0.13*

* p<0.1

Table 33: Factor Analysis for Items from Subordinate (first order)

	Factor [a]		
	1	2	3
Commitment to improvement	**0.69**	0.17	0.10
Decisiveness	**0.80**	0.10	0.02
Desire to lead	**0.74**	0.03	0.16
Determination	**0.64**	**0.33**	-0.09
Dream/Vision	**0.59**	-0.04	**0.40**
Emphasis on customer	**0.64**	0.16	0.14
Insight	**0.75**	0.11	0.10
Readiness for the future	**0.72**	0.10	0.14
Communication 1	0.13	0.06	**0.77**
Communication 2	**0.40**	0.13	**0.45**
Creativity/Self-discipline	**0.34**	0.10	**0.57**
Emphasis on performance 1	**0.47**	0.24	0.26
Emphasis on performance 2	**0.47**	0.22	**0.32**
Respect for diversity	0.08	0.15	**0.72**
Respect for people	-0.04	0.28	**0.73**
Talent Development	**0.30**	0.25	**0.46**
Teamwork/Cooperation	**0.31**	0.33	**0.34**
Dedication	0.26	**0.48**	0.23
Emphasis on principle	0.10	**0.75**	0.10
Fair competition	0.08	**0.72**	0.19
Fair Treatment	0.06	**0.70**	0.23
Honest reporting	0.11	**0.76**	0.07
Resolute action	0.24	**0.68**	0.04

[a] Extraction method: principle component analysis. Rotation method: promax with Kaiser normalization. Explained variance: 73%

Table 34: Factor Analysis for Items from Subordinate (second order)

	Factor		
	1	2	3
Commitment to improvement	**0.70**	0.17	0.08
Decisiveness	**0.76**	0.16	-0.02
Desire to lead	**0.77**	0.02	0.14
Emphasis on customer	**0.68**	0.14	0.12
Insight	**0.76**	0.11	0.08
Readiness for the future	**0.76**	0.12	0.07
Communication 1	0.20	0.07	**0.69**
Emphasis on performance 1	**0.50**	0.26	0.20
Respect for diversity	0.14	0.13	**0.70**
Respect for people	0.02	0.26	**0.70**
Dedication	0.29	**0.50**	0.18
Emphasis on principle	0.11	**0.77**	0.06
Fair competition	0.09	**0.74**	0.16
Fair Treatment	0.08	**0.71**	0.19
Honest reporting	0.11	**0.77**	0.06
Resolute action	0.25	**0.70**	0.01

Colleague

Six items were used for the exploratory factor analysis. (Table 34 for basic statistics and correlations) Exploratory factor analysis using promax rotation and the three factors option generated unclean loading patterns. (Table 35) Then I eliminated items with loading of less than 0.4 and items which exhibited cross-loading greater than 0.3 (Osborne & Costello, 2004): honesty reporting. Ethics-related competency for colleague was eliminated because honesty reporting is the only item for this competency. Then I ran factor analysis again using the two factor options with 5 items. Factor analysis using 5 items generated clean loading patterns. (Table 36) Finally, three items for customer-related competency were identified, and two items for people-related competency were identified.

Table 35: Descriptive Statistics and Scale Items based on Colleague Evaluations (N=305)

Competency (* indicates included in final validated scale)	Survey Item of subordinate	Mean	sd	Min	Max							
Customer *	dream/vision	5.71	0.97	3	7	1						
Customer *	Insight	5.76	0.92	2	7	0.74*	1					
People *	communication 1***	5.76	1.00	3	7	0.61*	0.60*	1				
People *	respect for people	5.72	0.99	2	7	0.73*	0.72*	0.65*	1			
People*	teamwork/Cooperation	5.70	1.02	2	7	0.60*	0.60*	0.75*	0.64*	1		
Ethics	honest reporting	6.16	0.86	3	7	0.56*	0.61*	0.59*	0.58*	0.63*	1	
Virtuous vs. charismatic**		3.66	1.57	1	6	0.15*	0.11*	-0.18*	0.10*	0.01	-0.02	1
Risk taking vs. risk management**		4.09	1.41	1	6	0.05	-0.01	0.13*	0.02	0.10*	0.03	0.01

* p<0.1

** excluded from factor analysis

*** This item moved from people-related competency to customer-related competency

Table 36: Factor Analysis for Items from Colleague (first order)

	Factor	
Variable	1	2
Insight	**0.74**	0.12
Dream/Vision	**0.74**	0.12
Respect for people	0.16	**0.70**
Communication 1	**0.65**	0.23
Teamwork/Cooperation	0.12	**0.74**
Honest reporting	0.30	0.49

Table 37: Factor Analysis for Items from Colleague (second order)

	Factor	
Variable	1	2
Insight	**0.73**	0.14
Dream/Vision	**0.73**	0.13
Respect for people	0.17	**0.7**
Communication 1	**0.64**	0.25
Teamwork/Cooperation	0.16	**0.7**

Supervisor

Ten items were used for the exploratory factor analysis. (Table 37 and 38 for basic statistics and correlations) Exploratory factor analysis using promax rotation and the three factors option generated unclean loading patterns. (Table 39) Then I eliminated items with loading of less than 0.4 and items which exhibited cross-loading greater than 0.3 (Osborne & Costello, 2004): commitment to improvement, desire to lead, and honest reporting. Then I ran factor analysis again with 7 items, which generated unclean loading patterns. (Table 40) I eliminated items with loading of less than 0.4 and items which exhibited cross-loading greater than 0.3: readiness for the future. Then I reran factor analysis with 6 items and the results generated clean loading patterns. (Table 41) Finally, three items for customer-related competency were identified and three items for people-related competency were identified.

Table 38: Descriptive Statistics and Scale Items Based on Supervisor Evaluations (N=87)

Competency (* indicates included in final validated scale)	Survey Item of subordinate	Mean	sd	Min	Max
Customer	commitment to improvement	5.91	0.82	3	7
Customer	desire to lead	6.24	0.81	3	7
Customer *	dream/vision	5.90	0.84	3	7
Customer *	insight	6.06	0.80	3	7
Customer *	readiness for the future	5.91	0.74	3	7
People *	creativity/self-discipline	6.00	0.81	3	7
People *	respect for diversity	6.00	0.89	3	7
People *	talent development***	5.89	0.71	3	7
People	teamwork/cooperation	6.25	0.77	3	7
Ethics	honest reporting	6.39	0.96	1	7
Ethics	resolute action	3.49	1.55	1	6
Virtuous vs. charismatic**		3.94	1.34	1	6
Risk taking vs. risk management**		5.91	0.82	3	7

** excluded from factor analysis

*** This item moved from people related competency to customer related competency

Table 39: Correlations Among Survey Items of Supervisor

	Variable											
1	Commitment to improvement	1										
2	Desire to lead	0.65*	1									
3	Dream/Vision	0.69*	0.58*	1								
4	Insight	0.65*	0.69*	0.66*	1							
5	Readiness for the future	0.64*	0.6*	0.53*	0.6*	1						
6	Creativity/Self-discipline	0.65*	0.58*	0.48*	0.46*	0.52*	1					
7	Respect for diversity	0.6*	0.56*	0.46*	0.6*	0.66*	0.53*	1				
8	Talent Development	0.56*	0.46*	0.47*	0.5*	0.55*	0.7*	0.6*	1			
9	Teamwork/Cooperation	0.63*	0.61*	0.63*	0.54*	0.6*	0.51*	0.51*	0.54*	1		
10	Honest reporting	0.61*	0.52*	0.57*	0.54*	0.49*	0.57*	0.53*	0.6*	0.5*	1	
11	Virtuous vs. charismatic	0.12	0.15	0.09	0.17	0.01	-0.05	0	-0.25*	0.1	-0.01	1
12	Risk taking vs. risk management	-0.07	-0.06	-0.24*	-0.07	0.02	0.08	0.08	0.21*	-0.12	0.12	-0.39*

* $p<0.1$

Table 40: Factor Analysis for Items from Supervisor (first order)

	Factor		
	1	2	3
Commitment to improvement	**0.53**	0.04	**0.30**
Desire to lead	**0.57**	-0.07	**0.36**
Dream/Vision	**0.82**	0.05	-0.05
Insight	**0.56**	0.26	0.11
Readiness for the future	0.22	0.13	**0.52**
Creativity/Self-discipline	0.11	**0.72**	0.02
Respect for diversity	-0.03	**0.74**	0.15
Talent Development	**0.52**	0.16	0.14
Teamwork/Cooperation	0.04	0.27	**0.56**
Honest reporting	**0.34**	**0.46**	0.01

Table 41: Factor Analysis for Items from Supervisor (second order)

	Factor	
	1	2
Insight	**0.65**	0.25
Dream/Vision	**0.78**	-0.01
Readiness for the future	0.46	0.36
Creativity/Self-discipline	0.12	**0.70**
Teamwork/Cooperation	0.25	**0.54**
Respect for diversity	0.05	**0.76**
Talent Development	**0.65**	0.15

Table 42: Factor Analysis for Items from Supervisor (third order)

	Factor	
	1	2
Insight	**0.65**	0.25
Dream/Vision	**0.78**	0.00
Creativity/Self-discipline	0.12	**0.70**
Teamwork/Cooperation	0.25	**0.51**
Respect for diversity	0.06	**0.76**
Talent Development	**0.62**	0.17

Manager effect

With regard to the evaluations of colleagues and subordinates, there may be a manager effect because colleagues and subordinates are nested under a manager. I calculated the interclass correlation (ICC) of all items for subordinate and colleague. Table 42 shows ICC of all items for subordinate. Values of all items are below 0.25. Therefore, this indicates that there is no manager effect on the items for subordinate. Table 43 shows ICC of all items for colleague. Values of all items except virtuous leader versus charismatic leader (ICC = 0.35) are below 0.25. This suggests that there is no manager effect on the items for colleague except for one item.

Table 43: Interclass Correlations of Items from Supervisor

	Variable	ICC of Subordinate
1	Commitment to improvement	0.09918
2	Decisiveness	0.13643
3	Desire to lead	0.07559
4	Determination	0.09495
5	Dream/Vision	0.14251
6	Emphasis on customer	0.06417
7	Insight	0.10336
8	Readiness for the future	0.10627
9	Communication 1	0.22553
10	Communication 2	0.14927
11	Creativity/Self-discipline	0.14091
12	Emphasis on performance 1	0.0749
13	Emphasis on performance 2	0.08817
14	Respect for diversity	0.18461
15	Respect for people	0.20841
16	Talent Development	0.11205
17	Teamwork/Cooperation	0.13774
18	Dedication	0.10373
19	Emphasis on principle	0.09369
20	Fair competition	0.08757
21	Fair Treatment	0.09714
22	Honest reporting	0.07678
23	Resolute action	0.07493
24	Virtuous vs. charismatic	0.27873
25	Risk taking vs. risk management	0.06381

Table 44: Interclass Correlations of Items from Colleague

	Variable	ICC of Colleague
1	Insight	0.10304
2	Dream/Vision	0.09984
3	Respect for people	0.08885
4	Communication 1	0.07585
5	Teamwork/Cooperation	0.05521
6	Honest reporting	0.00157
7	Virtuous vs. charismatic	0.35253
8	Risk taking vs. risk management	0.1131

Item analysis

Table 44 and 45 show the basic statistics and correlations of all items. I created competency variables from subordinate, colleague, and supervisor data based on the results of factor analysis. (Table 46 and 47)

Subordinate: I calculated the Cronbach's alpha of three variables to measure their reliability: customer-related competency, people-related competency, and ethics-related competency. Customer-related competency measured by seven items (i.e., commitment to improvement, decisiveness, desire to lead, emphasis on customer, insight, readiness for the future, and emphasis on performance 1) demonstrate strong reliability. (Cronbach's alpha of 0.96) People-related competency measured by three items (i.e., communication 1, respect for diversity, and respect for people) also shows strong reliability. (Cronbach's alpha of 0.93) Ethics-related competency measured by six items (i.e., dedication, emphasis on principle, fair competition, fair Treatment, honest reporting, and resolute action) also exhibits strong reliability. (Cronbach's alpha of 0.96)

Colleague: I calculated the Cronbach's alpha of two variable customer-related competency and people-related competency, because the items for ethics-related competency did not show clean loading in the factor analysis. Customer-related competency measured by three items (i.e., dream/vision, insight, and communication 1) demonstrates strong reliability. (Cronbach's alpha of 0.88) People-related competency measured by two items (i.e., respect for people and teamwork/cooperation) also shows strong reliability (Cronbach's alpha of 0.85)

Supervisor: I calculated the Cronbach's alpha of two variables, customer-related competency and people-related competency, because items for ethics-related competency did not show clean loading in the factor analysis. Customer-related competency measured by three items (i.e., dream/vision, insight, readiness for the future and talent development) demonstrates strong reliability. (Cronbach's alpha of 0.87) People-related competency measured by two items (i.e., creativity/self-discipline and respect for diversity) also shows strong reliability (Cronbach's alpha of 0.82)

Table 45: Comparison of All Items from Subordinate, Colleague, and Supervisor

Competency	Survey Item	Mean_sub	Mean_super	Mean_coll	sd_sub	sd_super	sd_coll	Min_sub	Min_super	Min_coll	Max_sub	Max_super	Max_coll
	Number of responses	751	87	305	751	87	305	751	87	305	751	87	305
Customer	Commitment to improvement	6	5.91		1.21	0.82		1	3		7	7	
	Decisiveness	5.89			1.31			1			7		
	Desire to lead	5.82	6.24		1.28	0.81		1	3		7	7	
	Determination	6.14			1.15			1			7		
	Dream/Vision	5.69	5.9	5.71	1.46	0.84	0.97	1	3	3	7	7	7
	Emphasis on customer	5.95			1.18			1			7		
	Insight	5.9	6.06	5.76	1.35	0.8	0.92	1	3	2	7	7	7
	Readiness for the future	5.84	5.91		1.34	0.74		1	3		7	7	
People	Communication 1	5.81		5.76	1.5		1	1		3	7		7
	Communication 2	5.85			1.36			1			7		
	Creativity/ Self-discipline	5.8	6		1.4	0.81		1	3		7	7	
	Emphasis on performance 1	5.88			1.3			1			7		
	Emphasis on performance 2	5.83			1.32			1			7		
	Respect for diversity	5.71			1.48			1			7		
	Respect for people	5.95	5	5.72	1.4	0.89	0.99	1	3	2	7	7	7
	Talent Development	5.88	5.89		1.32	0.71		1	3		7	7	
	Teamwork/Cooperation	5.9	6.25	5.7	1.34	0.77	1.02	1	3	2	7	7	7
Ethics	Dedication	6			1.24			1			7		
	Emphasis on principle	6.2			1.09			1			7		
	Fair competition	6.18			1.12			1			7		
	Fair Treatment	6.1			1.19			1			7		
	Honest reporting	6.16	6.39	6.16	1.14	0.96	0.86	1	1	3	7	7	7
	Resolute action	6.12	3.49		1.1	1.55		1	1		7	6	
	Virtuous vs. charismatic	3.78	3.94	3.66	1.72	1.34	1.57	1	1	1	6	6	6
	Risk taking vs. risk management	4.49	5.91	4.09	1.39	0.82	1.41	1	3	1	6	7	6

Table 46: Correlations of All Items from Subordinate, Colleague, and Supervisor

	Subordinate evaluation	1	2	3	4	5	6	7	8	9	10	11	12	13
1	CI_sub[a]													
2	decisiveness_sub	0.80*												
3	DL_sub	0.86*	0.86*											
4	determination_sub	0.82*	0.77*	0.76*										
5	dreamvision_sub	0.86*	0.80*	0.85*	0.66*									
6	EC_sub	0.83*	0.76*	0.85*	0.74*	0.78*								
7	insight_sub	0.87*	0.81*	0.86*	0.83*	0.80*	0.83*							
8	RF_sub	0.87*	0.88*	0.89*	0.74*	0.84*	0.83*	0.90*						
9	communication1_sub	0.73*	0.67*	0.77*	0.57*	0.81*	0.73*	0.68*	0.71*					
10	communication2_sub	0.82*	0.82*	0.84*	0.72*	0.85*	0.79*	0.80*	0.84*	0.89*				
11	CS_sub	0.83*	0.74*	0.84*	0.67*	0.88*	0.81*	0.82*	0.83*	0.89*	0.90*			
12	EP1_sub	0.80*	0.80*	0.86*	0.68*	0.85*	0.83*	0.78*	0.83*	0.82*	0.87*	0.87*		
13	EP2_sub	0.83*	0.76*	0.85*	0.71*	0.87*	0.84*	0.83*	0.85*	0.83*	0.87*	0.91*	0.91*	
14	RD_sub	0.70*	0.61*	0.73*	0.51*	0.80*	0.67*	0.65*	0.70*	0.90*	0.83*	0.89*	0.81*	0.82*
15	RP_sub	0.76*	0.58*	0.71*	0.57*	0.83*	0.73*	0.72*	0.71*	0.89*	0.84*	0.90*	0.79*	0.83*
16	TD_sub	0.84*	0.75*	0.82*	0.72*	0.87*	0.84*	0.83*	0.85*	0.85*	0.90*	0.91*	0.88*	0.89*
17	TC_sub	0.85*	0.73*	0.79*	0.76*	0.83*	0.81*	0.82*	0.79*	0.82*	0.86*	0.86*	0.81*	0.87*
18	dedication_sub	0.83*	0.71*	0.76*	0.66*	0.82*	0.80*	0.78*	0.80*	0.80*	0.86*	0.87*	0.84*	0.86*
19	Eprin_sub	0.78*	0.62*	0.72*	0.67*	0.78*	0.76*	0.71*	0.72*	0.76*	0.80*	0.86*	0.79*	0.81*
20	FC_sub	0.79*	0.68*	0.75*	0.66*	0.79*	0.75*	0.77*	0.78*	0.78*	0.83*	0.85*	0.83*	0.83*
21	FT_sub	0.76*	0.69*	0.75*	0.63*	0.81*	0.74*	0.74*	0.76*	0.80*	0.84*	0.86*	0.84*	0.82*
22	HR_sub	0.77*	0.71*	0.71*	0.67*	0.76*	0.74*	0.74*	0.76*	0.73*	0.80*	0.79*	0.80*	0.80*
23	RA_sub	0.84*	0.75*	0.81*	0.72*	0.83*	0.80*	0.80*	0.83*	0.74*	0.80*	0.82*	0.80*	0.84*
24	VC_sub	-0.06	0.14	-0.06*	0.08*	-0.13	-0.12	-0.03	-0.09	-0.37*	-0.21*	-0.30*	-0.14	-0.19*
25	risk_sub	0.23*	0.12*	0.21*	0.18*	0.24*	0.18*	0.31*	0.27*	0.15	0.17	0.19*	0.17	0.25*
	colleague evalution													
26	insight_coll	0.26*	0.08	0.20*	0.16	0.17	0.18	0.23*	0.22*	0.01	0.12	0.16	0.11	0.17
27	dreamvision_coll	0.22*	0.07	0.16	0.13	0.10	0.12	0.14	0.13	-0.06	0.03	0.05	0.07	0.08
28	RP_coll	0.20*	-0.03	0.19*	-0.02	0.16	0.13	0.17	0.19*	0.15	0.16	0.25*	0.13	0.16
29	communication1_coll	0.30*	0.16	0.24*	0.19*	0.18*	0.22*	0.27*	0.29*	0.04	0.19*	0.16	0.17	0.15
30	CT_coll	0.16	-0.02	0.14	0.01	0.09	0.10	0.14	0.16	0.09	0.11	0.17	0.06	0.12
31	HR_coll	0.04	-0.12	-0.06	-0.06	0.04	-0.04	-0.01	0.02	-0.04	-0.08	0.01	-0.09	-0.01

32	VC_coll	0.02	0.18	0.05	0.22*	-0.04	0.07	0.07	0.08	-0.19*	-0.05	-0.13	0.00	0.02
33	risk_coll	0.06	-0.11	-0.03	0.00	0.04	0.07	0.05	0.06	0.12	0.06	0.08	0.00	0.07
	supervisor evaluation													
34	insight_super	0.22*	0.20*	0.20*	0.22*	0.11	0.14	0.19*	0.20*	0.08	0.18*	0.12	0.09	0.09
35	CI_super	0.22*	0.17	0.20*	0.22*	0.15	0.14*	0.16	0.15	0.06	0.16	0.10	0.02	0.02
36	dreamvision_super	0.19*	0.15	0.12	0.22*	0.06	0.12	0.14	0.11	0.02	0.11	0.06	0.00	0.04
37	CS_super	0.28*	0.24*	0.26*	0.24*	0.27*	0.27*	0.25*	0.27*	0.33*	0.33*	0.33*	0.20*	0.25*
38	CT_super	0.17	0.09	0.21*	0.16*	0.11	0.15	0.19*	0.17	0.10	0.17	0.15	0.10	0.15
39	RD_super	0.28*	0.11	0.24*	0.22*	0.20*	0.26*	0.24*	0.24*	0.25*	0.27*	0.25*	0.15	0.17
40	TD_super	0.12	0.09	0.14	0.09	0.07	0.07	0.06	0.11	-0.06	0.03	0.01	-0.04	-0.05
41	HR_super	0.31*	0.26*	0.30*	0.31*	0.22*	0.24*	0.26*	0.31*	0.18*	0.28*	0.20*	0.16	0.17
42	VC_super	0.04	0.22*	0.06	0.15	0.08	-0.04	0.02	0.06	-0.17	-0.04	-0.10	0.02	-0.02
43	risk_super	0.14	-0.04	0.05	0.06	0.20*	0.12	0.13	0.08	0.20*	0.13	0.17	0.15	0.18*

		14	15	16	17	18	19	20	21	22	23	24	25	26	27
14	RD_sub														
15	RP_sub	0.91*													
16	TD_sub	0.82*	0.89*												
17	TC_sub	0.78*	0.84*	0.86*											
18	dedication_sub	0.79*	0.84*	0.90*	0.86*										
19	Eprin_sub	0.76*	0.81*	0.85*	0.81*	0.88*									
20	FC_sub	0.79*	0.82*	0.88*	0.82*	0.89*	0.90*								
21	FT_sub	0.81*	0.84*	0.87*	0.84*	0.90*	0.90*	0.91*							
22	HR_sub	0.75*	0.78*	0.84*	0.84*	0.87*	0.85*	0.88*	0.89*						
23	RA_sub	0.71*	0.78*	0.85*	0.85*	0.88*	0.88*	0.90*	0.86*	0.89*					
24	VC_sub	-0.48*	-0.45*	-0.23*	-0.18	-0.22*	-0.27*	-0.24*	-0.25*	-0.22*	-0.11				
25	risk_sub	0.15	0.19*	0.18	0.24*	0.18*	0.23*	0.25*	0.20*	0.28*	0.30*	-0.01*			
	colleague evalution														
26	insight_coll	0.01	0.11	0.17	0.13	0.16	0.12	0.07	0.03	0.03	0.11	0.13	0.08		
27	dreamvision_coll	-0.11	0.02	0.10	0.07	0.08	0.10	0.02	0.01	0.00	0.08	0.26*	-0.05	0.73	
28	RP_coll	0.22*	0.26*	0.18	0.14	0.23*	0.23*	0.16	0.14	0.11	0.13	-0.30*	0.12	0.56*	0.50*

29	communication1_coll	0.02	0.15	0.25*	0.18	0.21*	0.17	0.12	0.09	0.10	0.17	0.16	0.03	0.83*	0.79*
30	CT_coll	0.14	0.16	0.10	0.08	0.13	0.15	0.09	0.03	0.04	0.11	-0.18*	0.04	0.57*	0.52*
31	HR_coll	-0.03	-0.01	-0.01	-0.05	0.02	0.08	0.02	-0.08	-0.06	0.02	-0.08	0.01	0.46*	0.46*
32	VC_coll	-0.26*	-0.24*	-0.05	-0.07	-0.10	-0.15	-0.13	-0.13	-0.07	-0.01	0.51*	-0.06	0.23*	0.19*
33	risk_coll	0.13	0.23*	0.16	0.11	0.09	0.11	0.14	0.13	0.15	0.15	-0.31*	0.22*	-0.08	-0.07
	supervisor evaluation														
34	insight_super	-0.01	0.05	0.15	0.17	0.17	0.12	0.13	0.09	0.13	0.20*	0.19*	0.04	0.26*	0.36*
35	CI_super	-0.04	0.02	0.08	0.16	0.07	0.15	0.07	0.07	0.05	0.15	0.20*	-0.04	0.20*	0.30*
36	dreamvision_super	-0.04	0.03	0.09	0.13	0.11	0.09	0.00	0.04	0.05	0.12	0.19*	0.01	0.18	0.28*
37	CS_super	0.27*	0.30*	0.33*	0.32*	0.31*	0.30*	0.28*	0.21*	0.22*	0.30*	-0.10	0.00	0.21*	0.24*
38	CT_super	0.07	0.13	0.15	0.20*	0.13	0.22*	0.16	0.14	0.16	0.20*	0.04	0.15	0.18*	0.30*
39	RD_super	0.23*	0.30*	0.26*	0.30*	0.28*	0.29*	0.29*	0.22*	0.21*	0.28*	-0.20*	0.13	0.15	0.14
40	TD_super	-0.06	-0.01	0.04	-0.01	0.00	0.05	-0.02	-0.02	-0.02	0.04	0.07	0.05	0.16	0.34*
41	HR_super	0.14	0.15	0.27*	0.29*	0.33*	0.31*	0.25*	0.22*	0.25*	0.34*	0.03	0.15	0.15	0.16
42	VC_super	-0.22*	-0.24*	-0.07	-0.02	-0.16	-0.13	-0.12	-0.11	-0.08	0.00	0.54*	0.01	0.06	0.12
43	risk_super	0.19*	0.26*	0.22*	0.21*	0.28*	0.35*	0.36*	0.29*	0.24*	0.25*	-0.19*	0.28*	0.00	0.02

		28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
28	RP_coll																
29	communication1_coll	0.59*															
30	CT_coll	0.76*	0.60*														
31	HR_coll	0.54*	0.44*	0.66*													
32	VC_coll	-0.36*	0.15	-0.10	-0.03												
33	risk_coll	0.08	-0.01	0.02	-0.04	-0.14											
	supervisor evaluation																
34	insight_super	0.08	0.35*	0.18	0.13	0.12	-0.06										
35	CI_super	0.10	0.24*	0.20*	0.11	0.01	-0.07	0.65*									
36	dreamvision_super	-0.04	0.23*	0.08	-0.02	0.14	-0.05	0.69*	0.58*								
37	CS_super	0.22*	0.22*	0.27*	0.26*	-0.05	0.03	0.65*	0.58*	0.48*							

38	CT_super	0.22*	0.29*	0.21*	0.13	-0.09	-0.02	0.60*	0.56*	0.46*	0.53*					
39	RD_super	0.22*	0.25*	0.29*	0.20*	-0.14	0.03	0.56*	0.46*	0.47*	0.70*	0.60*				
40	TD_super	0.18	0.28*	0.19*	0.10	-0.03	-0.12	0.63*	0.61*	0.63*	0.51*	0.51*	0.54*			
41	HR_super	0.06	0.26*	0.10*	0.10	-0.01	0.05	0.61*	0.52*	0.57*	0.57*	0.53*	0.60*	0.50*		
42	VC_super	-0.32*	0.05	-0.30*	-0.14	0.46*	-0.21*	0.12	0.15	0.09	-0.05	0.00	-0.25*	0.10	-0.01	
43	risk_super	0.16	0.04	0.09	0.24*	-0.28*	0.24*	-0.07	-0.06	-0.24*	0.08	0.08	0.21*	-0.12	0.12	-0.39*

* p<0.1 [a] sub=subordinate, coll=colleague, super=supervisor CI=Commitment to improvement, DL=Desire to lead, EC=Emphasis on customer, RF=Readiness for the future, CS=Creativity/Self-discipline, EP1=Emphasis on performance 1, EP2=Emphasis on performance 2, RD=Respect for diversity, RP=Respect for people, TD=Talent Development, TC=Teamwork/Cooperation, Eprin=Emphasis on principle, FC=Fair competition, FT=Fair Treatment, HR=Honest reporting, RA=Resolute action, VC=Virtuous vs. charismatic, risk=Risk taking vs. risk management

Table 47: Comparison of Variables from Subordinate, Colleague, and Supervisor

Variable[d]	Mean	Std. Dev.	Min	Max
customer_sub[a]	5.99	0.50	4.47	6.80
people_sub[a]	5.94	0.67	3.19	7.00
ethics_sub[a]	6.22	0.45	4.63	6.95
VC_sub[a]	3.78	0.99	1.33	5.89
risk_sub[a]	4.51	0.61	2.33	5.71
customer_coll[b]	5.83	0.51	3.92	7.00
people_coll[b]	5.83	0.55	3.63	7.00
VC_coll[b]	3.65	1.16	1.00	6.00
risk_coll[b]	4.09	0.90	1.67	6.00
customer_ super[c]	5.98	0.65	3.00	7.00
people_super[c]	6.01	0.77	3.00	7.00
VC_super[c]	3.45	1.51	1.00	6.00
risk_super[c]	3.99	1.28	1	6

[a] N=751 [b] N=305 [c] N=87 [d] customer=customer competency, people=people competency, ethics=ethics competency, VC=Virtuous vs. charismatic, risk=Risk taking vs. risk management

Table 48: Correlations of Variables from Subordinate, Colleague, and Supervisor

No	Variable[d]	1	2	3	4	5	6	7	8	9	10	11	12
1	customer_sub[a]												
2	people_sub[a]	0.83*											
3	ethics_sub[a]	0.88*	0.86*										
4	VC_sub[a]	-0.03	-0.36*	-0.19*									
5	risk_sub[a]	0.27*	0.21*	0.28*	-0.06								
6	customer_coll[b]	0.30*	0.14*	0.19*	0.16*	0.09							
7	people_coll[b]	0.25*	0.28*	0.25*	-0.22*	0.20*	0.69*						
8	VC_coll[b]	-0.01*	-0.24*	-0.15*	0.54*	-0.13	0.15*	-0.24*					
9	risk_coll[b]	0.07	0.18*	0.11	-0.26*	0.27*	0.05	0.15*	-0.21*				
10	customer_ super[c]	0.14*	0.02	0.06	0.13	0.11	0.32*	0.12	0.07	-0.02			
11	people_super[c]	0.22*	0.24*	0.20*	-0.11	0.20*	0.24*	0.24*	-0.08	0.06	0.74*		
12	VC_super[c]	0.04*	-0.20*	-0.10	0.54*	-0.05	0.05	-0.28*	0.45*	-0.21*	0.12	-0.12	
13	risk_super[c]	0.06	0.16*	0.21*	-0.15*	0.20*	0.02	0.08	-0.23*	0.25*	-0.07	0.12	-0.27*

* p<0.1 [a] N=751 [b] N=305 [c] N=87 [d] customer=customer competency, people=people competency, ethics=ethics competency, VC=Virtuous vs. charismatic, risk=Risk taking vs. risk management

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